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AVIATION WEEK

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WINGS

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AVIATION CALENDAR

Jan. 14-16—National Symposium on Reliability and Quality Control in Electronics, sponsored by IRE, ASQC, AIEE and RETMA. Hotel Statler, Washington, D. C.

Jan. 14-18—Annual Meeting, Society of Automotive Engineers. Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

Jan. 17-18—General Assembly, Engineers Joint Council, Hotel Statler, New York.

Jan. 17-18—373d Meeting, National Industrial Conference Board. Hotel Commodore, New York.

Jan. 21-22—Symposium on Solar Furnace Design and Operation, Hotel Westward Ho, Phoenix, Ariz.

Jan. 21-25—Winter General Meeting, American Institute of Electrical Engineers, Hotel Statler, New York.

Jan. 27-28—American Society for Metals, Albuquerque, and Los Alamos Chapters. 'Heat Tolerant Metals for Aerodynamic Applications,' Albuquerque, N. M.

Jan. 28-31—5th Plant Maintenance & Engineering Conference. Public Auditorium, Cleveland, Ohio.

Jan. 28-31—25th Annual Meeting, Institute of the Aeronautical Sciences. Sheraton-Astor Hotel, New York, N. Y. Honors Night Dinner, Jan. 28.

Jan. 30—Annual Meeting, Convertible Aircraft Pioneers Engineers Club, New York.

Jan. 31-Feb. 1—Conference on Digital Computing in the Aircraft Industry, sponsored by New York University and International Business Machines Corp., NYU Bronx Campus, New York, N. Y.

Feb. 4-8—Course on X-ray diffraction, sponsored by North American Philips Co., 750 S. Fulton Ave., Mt. Vernon, N. Y.

Feb. 7—Operations Research Symposium, University Museum Lecture Hall, University of Pennsylvania, Philadelphia, Pa.

Feb. 7—Annual Mid-Winter Symposium of the New York Section, Instrument Society of America, Garden City Hotel, Long Island, N. Y.

Feb. 14-15—1957 Transistor and Solid State Circuits Conference, University of Pennsylvania, Philadelphia, Pa.

(Continued on page 6)

AVIATION WEEK • JANUARY 14, 1957
Vol. 66, No. 2

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AVIATION CALENDAR

(Continued from page 4)

Feb 16-19—6th Annual Trade Show & Convention Institute of Surplus Dealers, New York Trade Show Bldg., New York

Feb 26-28—Western Joint Computer Conference sponsored by IRE, AIEE and ACM, Hotel Statler, Los Angeles, Calif

Mar. 7-9—National Conference on Aviation Education, Hotel Mayflower, Washington, D. C.

Mar. 11-15—1957 Atomic Exposition, including Nuclear Engineering & Science Congress, 5th Atomic Energy in Industry Conference and 5th Hot Laboratories & Equipment Conference Convention Hall, Philadelphia, Pa.

Mar. 14-15—Flight Propulsion Meeting (Classified), sponsored by IAS, Hotel Carter, Cleveland, Ohio

Mar. 18—Gas Turbine Power Conference, sponsored by American Society of Mechanical Engineers, Sheraton Cadillac Hotel, Detroit, Mich.

Mar. 18-21—Pacific Coast Plastics Exposition, in conjunction with The Society for Plastics Industry National Conference, Shrine Exposition Hall, Los Angeles

Mar. 18-21—National Convention, Institute of Radio Engineers, New York Coliseum and Hotel Waldorf Astoria, New York

Mar. 18-21—First Military Automation Exposition, New York Trade Show Building, 500 Eighth Ave., New York. For details write Richard Rimbach Associates, 845 Ridge Ave., Pittsburgh 12, Pa.

Mar. 19-21—51st National Meeting of the American Meteorological Society, University of Chicago

Mar. 27-29—Educational Colloquium on Radiation Effects on Materials, sponsored by Office of Naval Research and Glenn L. Martin Co., Johns-Hopkins University, Baltimore, Md.

Apr. 2-5—National Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, sponsored by Society of Automotive Engineers, Hotel Commodore, New York

Apr. 17-20—Eighth Annual Conclave, Arnold Air Society, including aviation equipment display, Hotel New Yorker, New York, N. Y.

May 1-3—Spring Meeting and Exhibit, Society for Experimental Stress Analysis, Hotel Statler, Boston, Mass.

May 6-8—28th Annual Meeting, Aero Medical Assn., Shirley Savoy Hotel, Denver, Colo.

May 8-11—13th Annual National Forum, American Helicopter Society, Sheraton Park Hotel, Washington, D. C.

May 24-June 2—2nd Paris Air Show, Society of French Aircraft Constructors, Le Bourget Airport, Paris

June 1-9—First Annual National Aviation Trade Show, Monmouth County (N. J.) Airport

June 23-25—29th Annual Meeting, Aviation Distributors & Manufacturers Assn., The Broadmoor, Colorado Springs, Colo.

Sept. 1-6—Sixth International Aeronautical Conference, Royal Aeronautical Society and Institute of the Aeronautical Sciences, Folkstone and London, England

Sept. 2-8—1957 Flying Display, Society of British Aircraft Constructors, Farnborough, England

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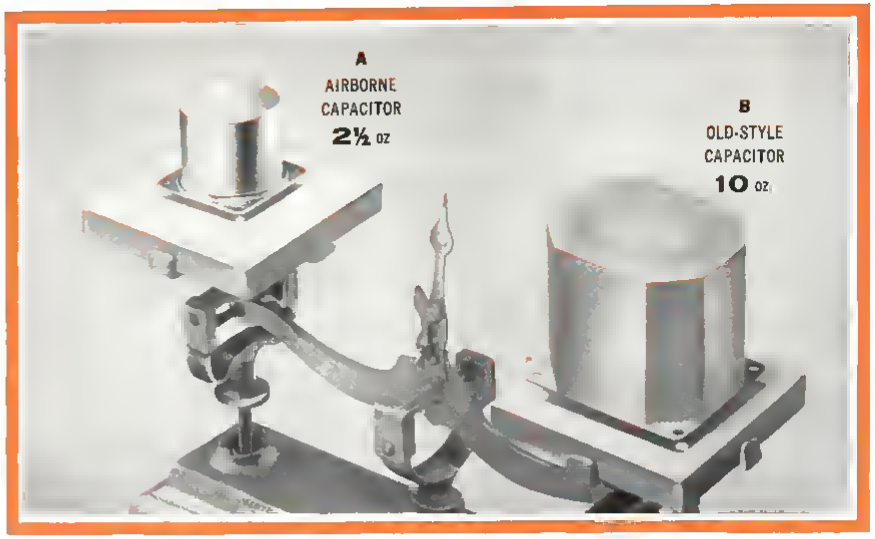

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Dielectric	Mylar	Paper
Dielectric Strength	1500 v	500 v
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Temp. Range	—65° to +300°F	—55° to +160°F

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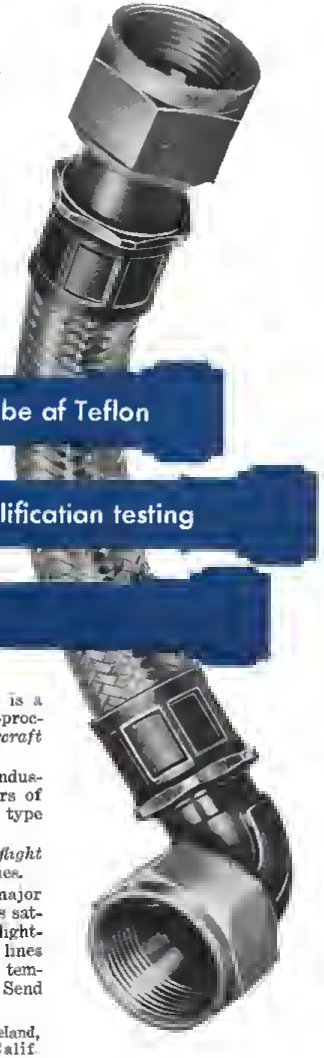

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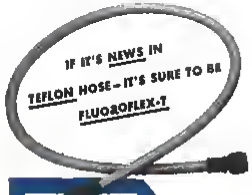

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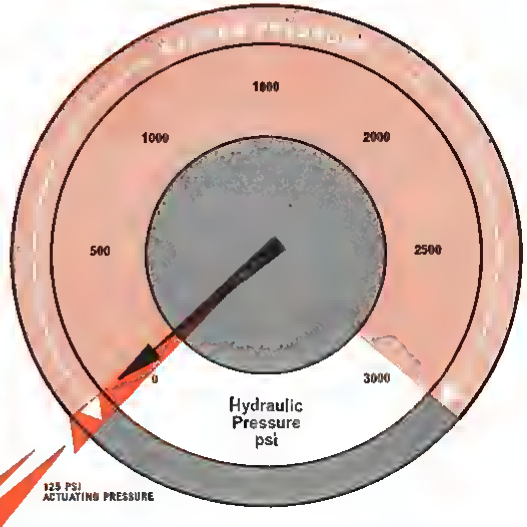

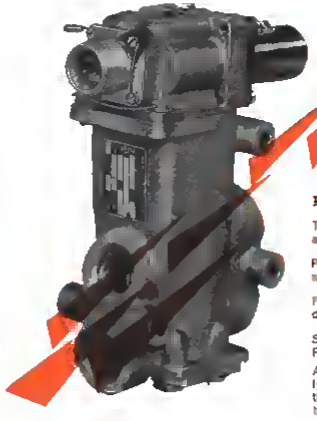

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TEMPERATURE —65°F to +300°F fluid and ambient temperature.

PRESSURE. Operating pressure 3000 psi at —65°F to +300°F.

PRESSURE DROP. Looped pressure drop at 12 gpm is 110 psi.

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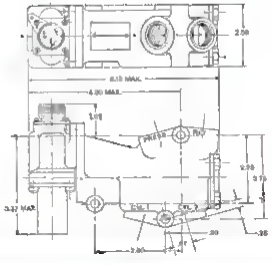

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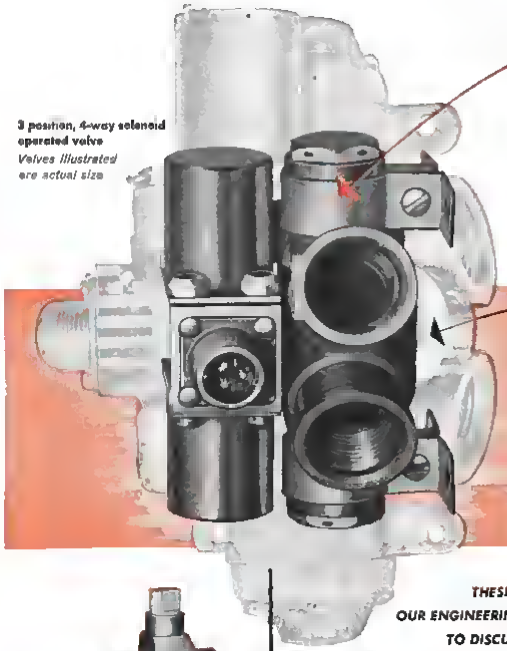
Now! ADEL offers a new line of HIGH TEMPERATURE MINIATURE VALVES



3 position, 4-way solenoid operated valve
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Performance and environmental demands, in conjunction with design simplicity, size and weight—all requirements a valve must face—are met by these revolutionary new models.

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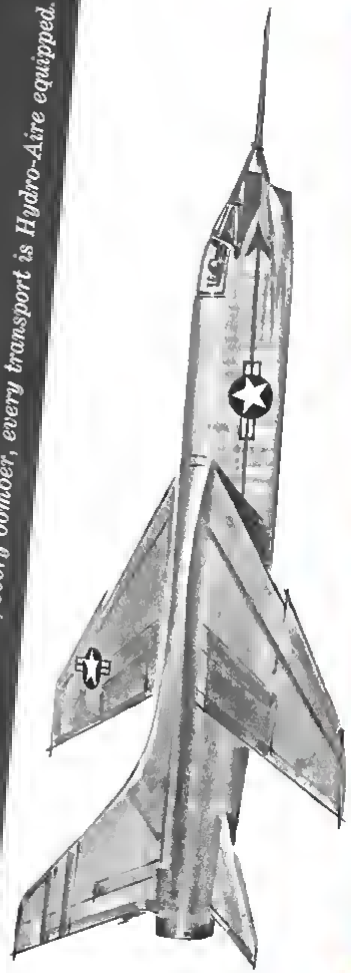

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Hy-v/l* Fuel Pumps are Standard Equipment on the F8U-1

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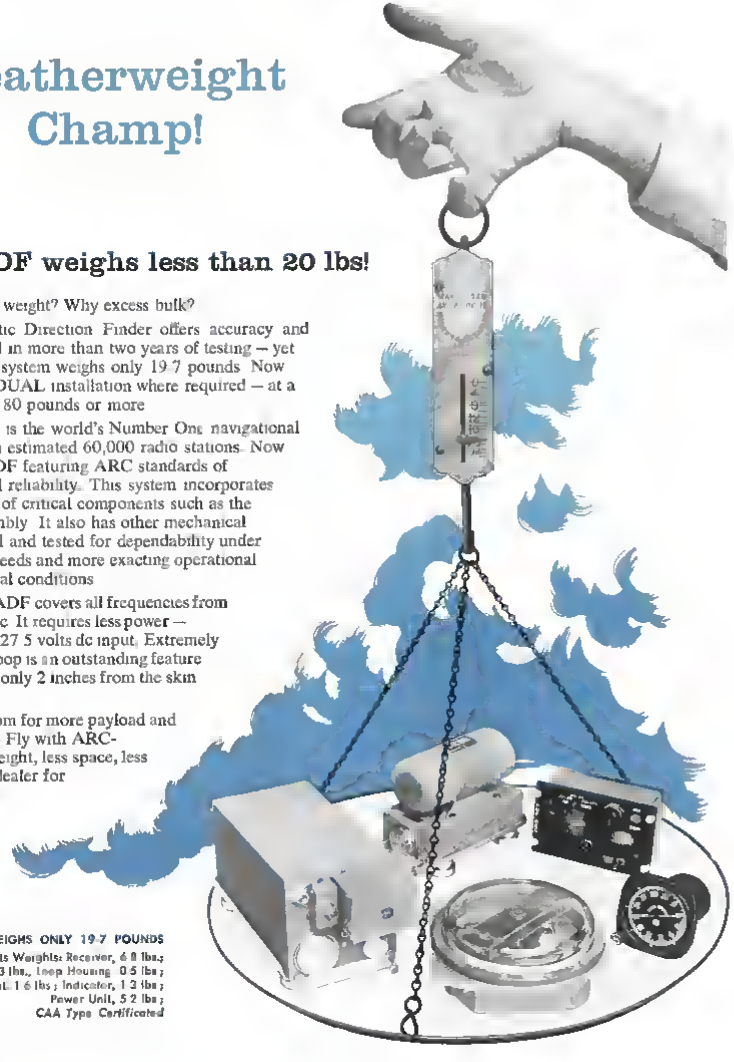

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TYPE 21 ADF WEIGHS ONLY 19.7 POUNDS
Component Units Weights: Receiver, 6.8 lbs.; Loop, 4.3 lbs., Loop Housing 0.5 lbs.; Control Unit, 1.6 lbs.; Indicator, 1.2 lbs.; Power Unit, 5.2 lbs.; CAA Type Certificated

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How you can "squeeze" 64 simultaneous messages into a single frequency

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Scope pattern taken from Hoffman CV-157 showing two dualtone teletype channels on upper sideband, carrier partially suppressed. Each sideband can carry 32 teletype channels at one time.

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AM voice on lower sideband, dualtone teletype channel on upper. With suitable multiplexing equipment the CV-157 handles 64 simultaneous dualtone teletype channels.

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AVIATION WEEK

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COVER Douglas C-124 flying test bed with Pratt & Whitney aircraft T57 turboprop engine in nose is effective way of testing advanced engine design. Globemaster had to be beefed up structurally in forward sections to handle increased power of T57 rated up to 15,000 eshp at sea level. For a look at C-124 in Antarctic operations, see p. 88.

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AVIATION WEEK • JANUARY 14, 1957 • Vol. 66, No. 2
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EDITORIAL

Watch the Budget Closely

The Fiscal 1958 edition of the federal budget will appear in Washington this week. As usual the aviation industry should study it closely because it has enormous import for the economic future of both military and civil aviation. AVIATION WEEK will publish a complete analysis of the Fiscal 1958 federal budget in its next issue compiled by members of its Washington bureau.

This is an unusually significant budget for aviation because Fiscal 1958 brings the national airpower policy to a critical crossroads. The surplus funds left over from the Korean war are just about gone. For the first time the Defense Department budget will have to reflect the full cost of maintaining the current and projected military airpower. The first thing to look for in the Fiscal 1958 budget is whether it faces up to the $2 to $3 billion increase specified as necessary for Fiscal 1958 by USAF Secretary Donald Quarles and Chief of Staff Nathan F. Twining when they accepted the "austerity" budget for Fiscal 1957.

'One Shot' Economy

During testimony on the Fiscal 1957 budget both Secretary Quarles and General Twining noted that its limits were made possible only by 'one shot" economy measures that could not be repeated safely. They said in effect that the Fiscal 1957 budget limits were merely deferring payment of the full airpower bill until Fiscal 1958.

Last year President Eisenhower asked Congress for $16.2 billion for USAF and then three months later, when the hue and cry over airpower reached a peak, asked for an additional $500 million. Congress boosted even this request by $900 million to make a total of about $17.5 billion available for USAF.

If the USAF budget request for Fiscal 1958 is near this same level it will mean that the "one shot" economy policy has been translated into a permanent reduction and the second Eisenhower administration has launched into a long-range reduction program for military airpower.

Another item to watch closely is the aircraft and missile procurement account. USAF is now in the midst of a modernization program that will require heavy expenditures for new hardware over the next five years. If procurement is cut in Fiscal 1958 it will mean the administration has decided to stretch out the obsolescent cycle in the face of concrete evidence that the Russians are contracting theirs to put more modern equipment into their combat units at a faster rate.

More clues will be found in the operations and maintenance account. This is a good measuring stick to gage the combat efficiency of USAF. Without sufficient funds for flying time required for high level proficiency training and adequate maintenance to keep units close to full operational strength, the mere number of units carried on the order of battle is meaningless.

Research and Development

Perhaps the most important area of all is research and development. Defense Department has been firmly committed to the fallacy of a constant level research and development budget and has been skimping as much as possible in this vital area. Watch to see what happens here in the Fiscal 1958 budget because it will determine what kind of weapons we have to defend the free world five to ten years from now.

Also watch the President's budget message to see whether he candidly admits that the 137 wing USAF program has been abandoned and a lower force level set or whether the same old meaningless platitudes are used to disguise the real import of the budget figures.

There are many other vital airpower budgetary issues that will not become clear until the congressional debate on the appropriation bill begins. Among these are:

- Was the additional $900 million voted by Congress released by Defense Department to USAF?
- Was any of the additional research and development money appropriated by Congress released by Defense Department to USAF?

Additional Funds

During the congressional debate on the Fiscal 1957 budget the administration yielded to critics of its program by asking for the additional $500 million and specifically promised to accelerate production programs of the F-104 and F-101 supersonic fighters and the B-52 bomber. It will be interesting to find out whether these promises were kept or whether, as informed Pentagon sources claim, each of these specific programs has been either cut back or stretched out.

All signs point to a showdown battle over the same airpower issues that rocked the Congress, the Administration and the Pentagon during 1956. The Suez crisis and the continuing threat of Communist aggression and expansion in both the Middle East and Asia will lend additional significance to the new airpower debate.

—Robert Hotz

WHO'S WHERE

In the Front Office

Louis Polk, board chairman and president of the Sheffield Corp., vice president, director, group executive and member administration committee, Bendix Aviation Corp., Detroit, Mich.

Paul V. Galvin, board chairman, Motorola, Inc., Chicago, Ill. **Robert W. Galvin** succeeds Paul Galvin as president. Also **Daniel E. Noble**, executive vice president, Communications and Industrial Electronics; Semi-Conductor Products and Military Electronics Division; **Arthur L. Reese**, vice president-general manager, Communications and Industrial Electronics Division.

Fred M. Gillies, chairman and chief executive officer, and **Guy T. Avery**, president and chief administration officer, Acme Steel Co., Chicago, Ill. **Carl J. Sharp**, former chairman, continues as chairman, executive committee.

Carl G. Holschuh, president and general manager, and **Dr. Carl A. Frische**, executive vice president, Sperry Gyroscope Co., division Sperry Rand Corp., Great Neck, N. Y. Mr. Holschuh succeeds **Charles M. Green**, retired.

F. B. DeVall, president, Fluorulon Laboratories, Inc., Caldwell, N. J.

Eugene C. Taylor, vice president-maintenance and engineering (Tulsa, Okla.), American Airlines, Inc.

Cyrus S. Collins, vice president-sales and traffic, Pan American-Grace Airways, Inc., New York, N. Y.

Fred Beminger, executive vice president and treasurer, The Flying Tiger Line, Inc.

John B. Montgomery, general manager, Production Engine Department (formerly the Evendale Operating Department), General Electric Company's Aircraft Gas Turbine Division, Cincinnati, Ohio.

Honors and Elections

Bernard L. Whelan, vice president of United Aircraft Corp., has been elected chairman of the Helicopter Council of the Aircraft Industries Association for 1957. Mr. Whelan succeeds **Don R. Berlin**, board chairman and president, Vertol Aircraft Corp.

Miss Mary O'Connor, senior stewardess of United Air Lines, has been named recipient of the Levertone Award as "Aviation Woman of the Year."

Edward Keightley, aviation sales manager of Union Oil Company of California, has been elected 1957 chairman of the Aviation Advisory Committee of the American Petroleum Industries Committee, New York, and **J. H. Craddock**, aviation sales manager of Humble Oil and Refining Company, has been elected vice chairman.

Harry F. Vickers, president of Sperry Rand Corp., has received the American Society of Mechanical Engineers Medal for distinguished service in engineering and science. **Perry W. Pratt**, chief engineer of Pratt & Whitney Aircraft Co., received the ASME George Westinghouse Gold Medal for eminent achievements in the field of aircraft propulsion.

(Continued on page 140)

INDUSTRY OBSERVER

► Chance Vought Aircraft, Inc., is developing a new supersonic interceptor—the XF9U—to succeed the F5U Crusader. Navy's first 1,000 mph carrier-based fighter. Vought's XF9U is aimed at speeds of better than Mach 2.

► Boeing is developing an advanced version of its B-52 Stratofortress that will phase into production plans within the near future. Advanced B-52 will use Pratt & Whitney J75 engines, replacing the J57s in current models. Strategic Air Command has endorsed the proposal.

► Navy is about ready to make a decision in the hot competition between Grumman, Martin and Convair on a new aircraft for anti-submarine warfare. The decision will involve the awarding of contract for prototype construction.

► First test vehicle of Convair's Tartar missile program was fired late last month. The Tartar, a short-range anti-aircraft missile designed for launching from ships, resembles the Convair-developed Terrier anti-aircraft missile that has replaced the aft 8 in. gun batteries on the cruisers USS Boston and Canberra.

► USAF has not yet made a formal decision to place Convair's B-58 Hustler supersonic bomber into production, but long lead time sub-systems have been ordered for 17 aircraft in addition to the 13 now on order. Other pre-production preparations indicate the supersonic bomber with the rocket-propelled weapons pod will evolve into a production program for the Strategic Air Command.

► Navy utility helicopter competition has narrowed to proposals from Bell, Vertol, Hiller and Kaman. Final decision from Bureau of Aeronautics is imminent.

► Fuel for first-stage Vanguard vehicle is UMF-1, one of a series of three proprietary fuels developed by Shell Oil Co. to rigid specifications for quality and composition of the fuel. Current single source is a Shell West Coast refinery. RP-1, originally reported as the first-stage fuel, is a development of Mobiloil Co.

► Solar Aircraft has established a missile engineering section headed by Ludwig Roth, former assistant director of Army's Redstone Arsenal. Solar, which has no prime missile contracts at present, is preparing proposals on a variety of missile activities, including design and fabrication of components as well as prime contracts.

► Vertol Aircraft Corp. has prepared a multiple-lift study for the Army, utilizing up to three helicopters—each with a capacity equal to that of the Vertol H-21. Any one of the pilots could actuate trigger and drop load from all three aircraft in case of an emergency.

► Fairchild Aircraft will submit a proposal in Army's competition for a rotary-wing "flying crane." Fairchild conducted the study independently after Army awarded study contracts to five other manufacturers last August (AW Aug. 20, p. 30).

► Follow-on orders for Lockheed's C-130 probably will bring a total Air Force production order for about 400 of the cargo planes. Approximately 100 C-130s already are on order.

► Civil Aeronautics Administration is interested in one approach by Lockheed Aircraft Corp. toward developing a windshield for the Electra turboprop transport that will offer maximum resistance to bird impact. Development includes lining glass pane with a layer of rigid plastic and soft vinyl on the cockpit side to prevent shattering. CAA's interest may influence windshield design and construction in other jet-powered airliners.

Washington Roundup

What Budget Holds

Presentation of the Eisenhower administration's Fiscal 1958 budget on Wednesday is expected to set off a heated debate in Congress over the funds proposed for the Defense Department and particularly the Air Force.

The Tactical Air Command is almost certain to suffer severe cutbacks as the USAF command with lowest priority. So far as aircraft are concerned, slashes are predicted in the F-101, F-104 and F-105 programs. The Martin B-68 tactical bomber may never be produced if the Eisenhower-Humphrey-Wilson figures are not changed by Congress.

USAF is expected to face allocation of only $17.8 billion, at least $3.5 billion less than the minimum it considers necessary to do its job. Provision of necessary bases and personnel benefits will help cut into procurement of weapon systems, although the administration will argue that the $6 to $7 billion level of material deliveries is being continued. This is true. The rub, however, is that fewer units of usable hardware will be bought in order to pay for current operations and modernization. Funds proposed for the Navy will be in the area of $11.2 billion, for the Army, $10 billion.

In his State of the Union message to the Congress last week, the President cautioned against defense spending beyond what he termed "a wise and reasonable level." He declared:

By our research and development, more efficient weapons—some of amazing capabilities—are being constantly created. These vital efforts we shall continue.

"Yet, we must not delude ourselves that safety necessarily increases as expenditures for military research or forces in being go up. Indeed, beyond a wise and reasonable level, which is always changing and is under constant study, money spent on arms may be money wasted on sterile metal or inflated costs, thereby weakening the very security and strength we seek."

Defense Dollar and Inflation

With the Fiscal 1958 defense budget going to Congress this week, a study made by the office of Dr. Chifford C. Furnas, retiring Assistant Secretary of Defense for Research and Development, takes on added significance.

Dr. Furnas says a look at what has happened to the research and development dollar between 1949 and 1957 indicates an inflation of 43% during the period. Because of this, and because "life gets no simpler," Furnas expects some increase in funds for military R&D.

During Fiscal 1957, about $1.6 billion will be spent for defense research and development, and $3.5 billion for the "adaptation phase—buying prototypes (of new weapons) and producing in small amounts, testing, evaluating and training," Dr. Furnas said. He noted that this is only about one-seventh of the military budget, and roughly 1% of the gross national product.

To illustrate the increasing complexity of weapons, Furnas said that designing the B-29 took 2.7 million engineering man hours, the B-47 took 3.5 million, the B-52 four million, and the "estimate for the next round of chemical fuel bombers" is nine million.

Dr. Furnas plans to leave office on Feb. 15. He will return to the chancellorship of Buffalo University, from which he took a one-year leave of absence in December, 1955.

Missile Progress

The House Appropriations Subcommittee on Armed Services will make a favorable report on USAF's missile program within the near future. However, the report, which will go to the full committee, may be classified because of the detailed information it contains.

The subcommittee, headed by Rep. George Mahon (D-Tex.), visited the Air Research and Development Command's Western Development Division late last year to look into U.S. progress in the long-range missile field. Mahon said last week he was "more than pleased" by the tremendous progress being made in the ICBM and IRBM programs."

Airpower Report

The three Democratic members of the Senate Airpower Investigating Subcommittee are expected to issue a report criticizing inadequacies in the military aviation program sometime next week. The subcommittee, headed by Sen. Stuart Symington (D-Mo.), held extensive hearings last year during which USAF commanders reported that the capabilities of their commands needed bolstering because of new Soviet advances.

Sen. Leverett Saltonstall (Mass.), ranking Republican member, is expected to draft a minority report, probably with the assistance of the Department of Defense officials. The other Republican member, Sen. James Duff (R-Pa.), was defeated in the November elections.

CAB Appointment

Senate confirmation of Louis Hector as a Civil Aeronautics Board member seems assured. Hector, a 41-year-old Miami attorney, has the strong support of both Florida senators—Democrats George Smathers and Spessard Holland.

Selected for the post by President Eisenhower, Hector will fill the vacancy left by Democratic CAB Member Joseph P. Adams whose term expired on Dec. 31.

Hector, who has no background in aviation, has been president of Hector Supply Co., manufacturers of agricultural equipment since 1948. He also has maintained a law firm, Hector and Rutledge, in Miami. After graduation from Williams College, he attended Oxford University as a Rhodes scholar. He later obtained a law degree from Harvard University. In 1942-43, he served as an attorney with the Justice Department and the Lend-Lease Administration. In 1944, he was assistant to Under Secretary of State Edward Stettinius.

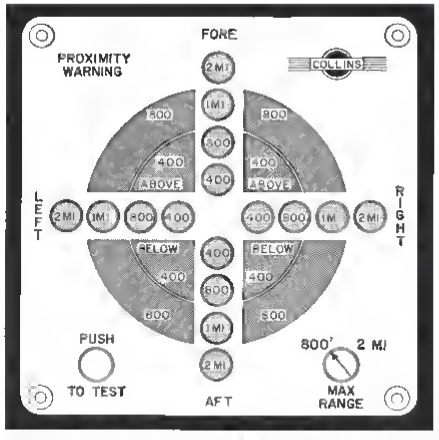
Although a Democrat, Hector supported President Eisenhower in both 1952 and 1956.

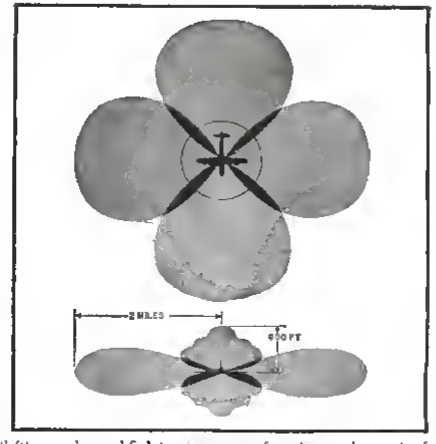
New Committeemen

New members of Senate committees with jurisdiction over civil and military aviation include:

▪ **Commerce Committee.** Sen. Frank Lausche (Ohio) fills the Democratic vacancy caused by the resignation of Sen. Sam Ervin (N.C.). On the Republican side, Sen. Norris Cotton (N.H.) replaces ex-Sen. James Duff (Pa.), who was defeated in the last election.

▪ **Armed Services.** Sen. Prescott Bush (Conn.) and Sen. Frank Barrett (Wyo.) step into the Republican spots formerly held by Duff and ex-Sen. Herman Welker (Idaho), also defeated last year. —Washington staff





COLLINS-ATA proximity warning indicator, as originally proposed (left), may be modified to give more information such as rate-of-closure with intruding aircraft. Proximity warning indicator as originally proposed was to use Doppler radar techniques with area coverage as shown above. Recent studies point to problems from ground reflections at altitudes below 12,000 ft.

Anti-Collision Protection Hopes Jolted

Collins Radio cancels orders for anti-collision systems, expressing grave doubts over feasibility.

By Philip J. Klass

Unprecedented action by Collins Radio Co. has sharply jolted airline industry hopes for early development and use of airborne proximity warning indicators (PWI) and automatic collision avoidance systems.

Collins has notified the Air Transport Association and customers, including most major U. S. airlines, that studies completed the previous week have raised "grave doubts whether collision detection and avoidance equipment can be developed with presently available techniques in a practical form to meet airline equipment requirements."

Simultaneously, Collins voluntarily canceled nearly $10 million in airline and business aircraft orders for PWI and collision avoidance equipment, releasing its customers from any obligation.

The unprecedented action by the airlines and Collins, in placing and accepting fleetwide orders for equipment that had not yet been developed, stemmed from last summer's Grand Canyon accident.

ATA is calling a closed meeting of airline engineering and operational people who will meet within several weeks to consider the implications of the Collins action and to decide upon the industry's next move.

Collins emphasizes that it has no intention of abandoning its work in the anti-collision field, but believes it can develop a more workable solution "if not bound by the method of attack (proposed) to the ATA and by obligations arising as the result of orders for equipment as specified in the proposal."

In its forthright statement, Collins adds: "Other responsible firms have made alternative proposals and we believe the airlines and other aircraft operators should be in a position to place their orders with the company that first makes practical and usable equipment available."

Behind the Move

The ATA-Collins anti-collision program was to be a two-phase development:

- **Phase I**: A proximity warning indicator, using Doppler radar techniques which would alert a pilot whenever another aircraft came within two miles of his airplane at its flight altitude, or within a radius of 800 feet above or below. (AW Sept. 24, p. 37)
- **Phase II**: A computer which could automatically determine from Phase I equipment whether a nearby aircraft posed a collision threat, i.e., where the "miss distance" was 800 ft. or less. In the event of collision hazard, the computer would automatically indicate the required evasive maneuver to the pilot.

The end objective was a completely automatic collision avoidance system, but the PWI Phase I portion was intended to provide partial anti-collision protection for more immediate implementation, with the Phase II to follow perhaps a year later. (Initial production of Phase I PWI's was scheduled for late in 1958.)

ATA Competition

In the ATA competition to select a company to develop anti-collision equipment, Collins proposed to develop the Phase I equipment, simultaneously studying the problem of automatic collision avoidance in greater detail than had been possible in the limited time available. In its proposal Collins stated, "It is hoped that these efforts will establish the feasibility of adding analytical and computational equipment to the device used for proximity detection to provide for the complete protection desired."

These analytical studies, completed late in December, revealed that inherent characteristics of the Doppler radar used in Phase I coupled with airplane movements in turbulent air, make it impossible for a computer to predict whether a collision threat actually exists. Hughes Aircraft Co. reportedly has reached the same conclusion within the past several weeks as a result of its own independent investigation into the dynamics of the anti-collision problem.

In the Collins-ATA system, and the Phase II part of the contemplated Hughes system, the computer determines whether a collision threat exists by examining the rate-of-closure between the two aircraft. If they are closing at a constant rate, as indicated by a constant frequency shift in the Doppler radar signal, a collision hazard exists, if the signal does not remain constant, there is no danger.

Momentary Variation

The trouble is that in mildly turbulent air, two aircraft may bounce around sufficiently to cause momentary variations in the rate-of-closure signal, despite the fact that the two aircraft are actually on collision paths. This variation in signal can mislead the computer into thinking that no hazard exists.

It is possible to smooth, or integrate, the Doppler signal to obtain an average rate-of-closure over a period of several seconds. However, this sharply reduces the already critically short time available to the pilots to take evasive action if same is required.

The recent Collins, Hughes findings confirm those reached earlier by Bendix Radio which concluded that the non-cooperative type of anti-collision system recommended by the ATA had serious limitations. (A cooperative type system operates only when the two aircraft involved are both equipped with compatible anti-collision devices or systems, a non-cooperative system works against all aircraft whether or not they are similarly outfitted.)

Cooperative vs. Non-Cooperative

Collins' recent action is expected to re-open the previously hotly debated question of cooperative versus non-cooperative types of anti-collision systems.

The ATA group, when it meets, will face two possible courses of action:

- **Continue PWI development** along present non-cooperative system lines, but increase its usefulness by designing it to give the pilot a visual indication of airplane closing rates, in addition to displaying relative position of the intruder airplane. Some observers believe that such a PWI system can provide considerable protection. In VFR weather, the PWI will alert pilot to look for intruder, in IFR weather, pilot will have to make own decision on whether evasive maneuver is required.
- **Investigate cooperative** type anti-collision systems, encouraging one or more companies to develop at least experimental systems for evaluation. Bendix Radio, confident of the soundness of its original analysis, has been working on a cooperative type system.

Tremendous industry pressure generated by the Grand Canyon incident, and subsequent publicity in the public press on the airline-Collins program, may force the ATA to explore both possibilities.

Common System Problems

Although the cooperative type system appears easier to accomplish technically than the non-cooperative type, it poses far more difficult political and implementation problems. For example, Common System standardization would be required to permit airliners to detect military aircraft and vice versa. The design of a system which would satisfy both the operational needs of Mach 2 military aircraft and the pocketbooks of private fliers would not be easy.

The Air Force currently is seeking industry proposals for an anti-collision system. Although USAF has not spelled out the techniques which must be used, the requirement that the system be suitable for use on Mach 2 aircraft, to protect against Mach 4 head-on closing rates, effectively eliminates the non-cooperative type system.

A cooperative type system could offer little anti-collision relief until at least 50% of the aircraft were equipped. This would take a minimum of five years, probably closer to 10, according to qualified observers.

One observer says that "we might get a good traffic control system, eliminating the need for airborne anti-collision systems, before we could get a cooperative type system effectively implemented."

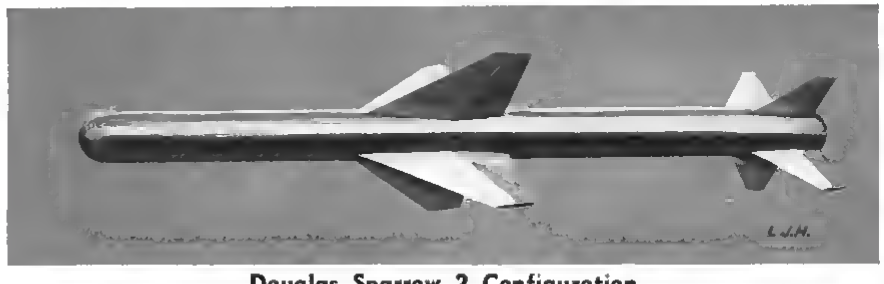
PWI Problems

However, even the development of a non-cooperative proximity warning indicator without an automatic collision avoidance computer is not without problems. For example, the Collins PWI would require installation of four 15-18 inch quadrantal radar antennas in the tail, nose and wing tips. This poses both aerodynamic streamlining and weight problems in a large jetliner. The weight of the antennas and coaxial cable that interconnects them is now estimated to weigh more than 100 pounds, it is reported.

If the present approach to PWI design can not grow into a fully automatic collision avoidance system, as Collins studies indicate, the company is not sure that the airlines can justify its weight, cost and aerodynamic penalty.

Furthermore, Collins engineers are now concerned over the problem of radar reflections from the ground at airplane altitudes below 12,000 feet. Although design remedies are available, they will add size, weight and/or circuit complexity.

These are some of the problems which suggest that the industry can not expect a speedy answer to the air collision problem.



Douglas Sparrow 2 Configuration

Sparrow 2, air-to-air missile developed for the Navy by Douglas Aircraft, is shown in this Aviation Week artist's drawing. Missile has active homing system with radar dish behind the blunted nose. Delta surfaces of Sparrow 1 have been truncated to trapezoidal form on Sparrow 2. Beam-riding Sparrow 1 developed by Sperry Gyroscope Co., is in service with fleet units on Vought F7U-3M Cutlass and McDonnell F3H-2M mother aircraft and in an all-weather installation on the Marine Corps Douglas F3Ds. Sperry-operated plant at Bristol, Tenn., now producing Sparrow 1, will be shifted to Sparrow 3 production either in late summer or early fall this year. Plant will then be operated by Raytheon, developers of the Sparrow 3. Current production rate will fill fleet logistic pipelines within one year.

French to Merge Sud-Est, Ouest State-Owned Airframe Companies

Paris—The two big state-owned French airframe companies—Sud Est Aviation and Ouest Aviation—will be merged Mar. 1 under the name Sud Aviation, giving French aviation the biggest reorganization since a large part of the industry was nationalized in the 1930s.

One of the major reasons for the merger, informed sources in the U.S. report, is increased emphasis on missile production and decrease in demand for conventional fighter aircraft. Also a factor is production of the twin-jet Caravelle airliner, a Sud-Est airplane for which Ouest builds the primary wing structure.

Tipoff to the move came last month when Georges Glasser, Ouest Aviation president and president of the French Aircraft Industries Assn., decided to leave Ouest to take a new post with a private company outside the airframe industry (AW Dec. 24, p. 31). Glasser has long been in friendly competition for control of the nationalized section of the industry with Georges Hereil, Sud-Est president who will become president of the merged companies.

Sud-Est Aviation presently is the largest of French builders, with 12,000 employes working in four plants. Ouest Aviation, slightly smaller, operates five factories with 10,000 workers. Total industry employment figure is 60,000.

The merger of two big state firms leaves only one other nationalized airframe company: the Nord concern. This company produces the Noratlas twin engine cargo plane, lightplanes, target missiles and is working on a light delta wing interceptor, the Gerfaut.

Most industry observers here feel it is only logical that Nord eventually would be absorbed into the new complex.

Thus the state would have only one airframe company just as it has only one big engine firm, the Societe d'Etudes Pour la Propulsion à Reaction (Snecma).

Aircraft production of Sud-Est Aviation and Ouest Aviation at present is complementary rather than competitive. Sud-Est is producing the twin-jet Caravelle passenger liner and five place Alouette helicopter. Ouest Aviation is turning out three versions of its twin jet Vautour for the French Air Force and the tiny two place jet helicopter, the Djinn. Ouest also has experimental Trident 2 interceptor, which combines jet with rocket power. Sud-Est presently is working on a similar type interceptor, the Durandal.

Actually main competition between the two big firms has been more in financial rather than design field. State has just so much money to spend on aircraft development and each of three state firms has to jostle the other for a share. When one is given more than another the state has to prune somewhere. Unlike other state-owned concerns, for example railroads and utilities, nationalized airframe companies never have been able to interest private investors in financing deals.

The merger will substantially strengthen nationalized sector of industry in its competition with the big private military airplane builder, Avions Dassault. Dassault equips about half the squadrons of the French air force as well as several foreign squadrons.

The industry is now talking about Dassault's attempt to crack into commercial business with supersonic passenger airliner. It should be noted, however, that though Dassault keeps about a third of industry working on its orders, most of production capacity is already in state hands. A good portion of Dassault Mystere fighters, for example, are built by Sud-Est and Ouest Aviation, though finally assembled by Dassault.

The merger between the two state firms, which were created in the mid-1930s, requires approval by National Assembly. It is reasonable to speculate that Dassault will oppose the move. Marcel Dassault, owner of Dassault, sat in the National Assembly for many years as Gaullist deputy and is rather influential in French politics.

On the other hand Hereil holds an important post in the Radical Party, a large center group in the Assembly. The air force reportedly is in favor of the merger.

Many individual aviation personalities fear the merger would remove too much competition to make the move worthwhile.

They also fear the merger is a continuation of the drive to push all private industry out of the large scale airframe industry.

Soviet Aircraft Export Sales Feared

London—Russia may become a serious competitor to Britain and the United States in the export sale of aircraft, the British Minister of Supply warns.

Minister Reginald Maulding told the opening session of a two-day conference on aircraft production at Southhampton that Russian production soon may be "a very serious matter indeed."

He said Russia not only has vast technical resources but the ability, with a controlled economy, to quote prices which private enterprise may have difficulty matching. The Russians therefore could successfully invade the markets dominated by the U.S. and Britain.

Maulding said the British aircraft industry should gear for this competition by concentrating its efforts on producing fewer types of aircraft. This already is being done in military aircraft, he stated.

His call for fewer projects was backed up by some strong talk from a German guest. Karl Frydag, a director of the German Henschel Co., told the conference flatly that the British aircraft industry is in an "extremely dangerous position." Frydag was in charge of German aircraft production in 1943.

"In my opinion, a country of the size of Great Britain is not in a position to complete successfully the many various projects she has undertaken," he said, adding that the German aircraft industry had been at its most efficient prior to 1942 because it concentrated on the development of only two types of fighters, one night fighter, two bombers and three types of engines.

After that, nervousness about its dwindling air superiority caused Germany to dissipate technical effort over a much wider field. Frydag said: "We lost the war in the air partly because for a certain period our original ideas of concentration were abandoned and we wasted our technical potential," he stated. "I am sorry to say that Great Britain is in this dangerous position."

Frydag said Britain should concentrate on transport aircraft, on one type of long-range supersonic fighter, one interceptor and a supersonic bomber. A night bomber could be manufactured under license from the U.S., he suggested, and guided missiles could be developed in cooperation with the U.S. or European countries.

Only by such a drastic cutback can Britain hope to overcome the fact that there are not enough engineers and technicians available to complete all the projects now underway, the German said.

O. S. Puckle of EMI Electronics, Ltd., warned the conference that Britain is lagging behind the U.S. in application of numerical control to machine tools in aircraft manufacture.

"This is a vast step forward in the control of machines which will permit more complicated parts to be made more quickly, more accurately and more cheaply," he added, "It provides a quite fantastic advantage which we cannot possibly afford to ignore."

'Free Enterprise' for Airlines Demanded

By Katherine Johnsen

Washington—Legislation designed to encourage new firms and provide more competition within the air transport industry was among the new bills introduced last week during the opening days of Congress.

The measure was sponsored by Rep. Emanuel Celler (D.-N.Y.), chairman of the House Judiciary Committee and of a subcommittee that conducted extensive hearings last year to determine whether there are any monopolistic situations or practices within the air transport industry. The subcommittee expects to release its report by mid-February.

'Free Enterprise'

Celler's bill would establish "the primacy of free enterprise" as the policy guide for the Civil Aeronautics Board and other regulatory agencies. Celler has objected that the agencies have placed too much emphasis on "regulation" of the existing industry and not enough on the introduction of new competitive firms.

His bill, he said, would "create a presumption in favor of free enterprise" and "assure that our anti-trust policy favoring competition is not subordinated."

The measure also calls upon the courts to enforce strongly the laws of competition. In the past, Celler says, "The courts have withheld their powers in these cases out of deference to superior technical experience—commonly referred to as 'expertise' of the regulatory agencies." The legislation is now pending before Celler's Judiciary Committee.

Other Bills

Other bills introduced:

■ **Helicopter Airlines.** The bill, sponsored by Rep. Isidore Bollinger (D.-N.Y.), would give permanent certification to these airlines. Two years ago the Senate Commerce said it would favor certification after the lines had received further operating experience.

■ **Inventions.** A bill introduced by Rep. Celler would authorize the National Inventors Council of the Department of Commerce to make awards of up to $50,000 for any "inventive contributions" which can be utilized by the armed services.

■ **Royalties.** Government departments and agencies would be given authority to reduce "royalty payments for the use of inventions" under another measure introduced by Celler. Aggrieved contractors would have recourse to the U.S. Court of Claims.

■ **Scientists and Technicians.** To build up the pool of scientists and technicians available to the armed services, legislation by Rep. Charles Bennett (D.-Fla.) would provide $3.5 million annually in scholarships to promising students who agree to a specified term of military service commensurate with the amount of the scholarship. The measure also would establish a "work study" program under which high school graduates could serve part-time with the military departments while attending college part-time. In addition, it would make it possible for officers on active duty to take advantage of veterans' education benefits in order to undertake studies in the technical and scientific fields, either on a part-time basis or on leave-of-absence.

■ **Manufacturers' Representatives.** Individuals or firms who receive commissions for obtaining government contracts would be required to file information on their activities with the House and the Senate under a measure by Rep. Kenneth Keating (R.-N.Y.).

■ **Government Ethics.** Two measures are directed toward the ethics of government officials in dealings with private individuals and firms.

One, introduced by Rep. Keating, broadens the ban on the employment of government officials by private industry. The present code prohibits a government employe dealing with a specific contract or controversy from accepting employment with a firm involved in the specific matter for two years afterward. Keating's bill would extend this to include general matters. For example, a government employe participating with a general regulation, or policy, relating to an industry, could not be employed by any firm in that industry for two years. The measure also would make the private employer, as well as the employe, subject to prosecution.

The second, sponsored by Rep. Bennett, would spell out a "code of ethics" for government officials. Among other things, it would prohibit government officials from accepting any favors or benefits that might be "construed" as affecting the performance of official functions.

■ **Civil Defense.** Numerous bills would establish a Department of Civil Defense in the Department of Defense—a move the military has vigorously opposed in the past on the grounds that it would divert the attention and interest of defense officials and be an added drain on defense funds. Sponsors include Rep. Celler, Rep. Walter Riehlman (R.-N.Y.), Rep. Eugene Keogh (D.-N.Y.) and Rep. Herbert Zelenko (D.-N.Y.).

■ **Mobilization.** The director of Defense Mobilization would be directed to establish policies on the retention and disposition of industrial properties in the mobilization program that are owned or leased by the government under legislation by Rep. Bruce Alger (D.-Tex.). The National Industrial Re-

Procurement Investigation Continues

Washington—House Armed Services Investigating Subcommittee will continue its investigation of the aircraft industry in the new Congress.

Chairman Carl Vinson (D.-Ga.) of the full Armed Service Committee introduced a resolution to continue the subcommittee at the opening of the session. The resolution authorizes the group to conduct "a full and complete investigation and study of all matters relating to procurement by the Department of Defense." The resolution also gives the subcommittee specific authority to look into the department's research and development programs. Rep. Edward Hebert (D.-La.) is expected to be re-named subcommittee chairman.

Other proposed investigations included:

■ **Central Intelligence.** Numerous bills establishing a joint congressional committee on central intelligence were introduced. Up to now, the activities of Central Intelligence Agency have never been reviewed by a Congressional Committee. Sponsors include Rep. Elizabeth Kee (D.-W.Va.), Rep. George Miller (D.-Calif.), Rep. A. S. J. Carnahan (D.-Mo.), Rep. Mel Price (D.-Ill.), Rep. Robert Sikes (D.-Fla.) and Rep. Clement Zablocki (D.-Wis.). Several Democratic senators are expected to sponsor similar legislation.

■ **Airline Subsidies.** Establishment of a five-member House committee to investigate all subsidies paid by the government is proposed in a resolution by Rep. H. R. Gross (R.-Ia.).

■ **Supersonic Aircraft.** Two resolutions propose investigations of the damages to private property in the vicinity of military installations by the operation of supersonic jet aircraft. One, by Rep. Pat Hillings (R.-Calif.), calls for an investigation by the Judiciary Committee. The other, by Rep. Henderson Lanaham (D.-Ga.), would give the investigation to the Armed Services Committee.

erve Review Committee—a group of 15 industrialists who now advise the Secretary of Defense on these matters—would be abolished.

• **Transportation Tax.** Bills to repeal the 10% transportation tax were introduced by Rep. Noah Mason (R-Ill.) and Rep. Abraham Multer (D-N. Y.). In view of the Eisenhower administration's opposition to any tax reductions, at this time the outlook for the legislation is dim.

• **Alcohol on Airlines.** Legislation aimed at banning alcoholic drinks on airlines was introduced by Rep. Thomas Lane (D-Mass.), Rep. John Williams (D-Miss.) and Rep. Carl Elliott (D-Ala.).

• **Segregation of Airline Facilities.** Segregation of passengers on airlines or airport facilities engaged in interstate commerce is prohibited in legislation introduced by Rep. Joseph O'Hara (R-Minn.).

(Civil Aeronautics Administration's present policy is not to participate in the financing of airports at which segregation is practiced.)

Dutch Rescue Helicopter

Dutch-owned Djinn turbine powered helicopter demonstrates use of rescue net at seashore. Sea anchor hanging from line on net steadies net when it is in the water. Sign on French-built Djinn shows canny Dutch method of meeting operational costs: it advertises cigarettes.

Army Cuts Contracts For Vertol's H-21C

Washington—U. S. Army has reduced its requirement for 36 cargo helicopter companies and will award no further follow-on contracts for Vertol Aircraft Corp.'s H-21C.

An Army spokesman said the cutback in cargo helicopter requirements will not affect contract prospects for the Sikorsky H-34, a helicopter with capabilities similar to the H-21.

There was no indication of exactly how many helicopters have been deleted from the Army program, but the situation for Vertol was considered serious in some quarters.

The company has enough H-21 orders to keep it busy for a year. The Army spokesman said it is possible that a delivery stretchout will be permitted to give the company more time to adjust its production line.

The H-21 is the only helicopter on the Vertol line. It is being manufactured for the Royal Canadian Air Force and the French Army in addition to the U. S. Army.

Earlier, the company built the HUP for the Navy and Army. Army designation was the H-25.

Less than a year ago, the Army canceled its development contract for the giant H-16 transport helicopter (AW April 23, p. 38).

Observers did not expect the Vertol line to shut down. Among the prospects:

• **Vertol is strong contender** in the utility helicopter competition being conducted by the Navy (see page 23). The Morton, Pa., plant is Navy cognizant.

• **Army is interested** in the H-21D, a twin turbine version of the H-21. Prototype of this aircraft will fly in a few months.

• **Both the H-21D** and the present piston powered version are scheduled for commercial certification by the Civil Aeronautics Administration. Vertol plans to make a strong bid with these aircraft in the commercial market.

• **There is some support** for a program to retrofit the H-21C with turbine engines, turning it into an H-21D. If this happens, it presumably will be done at the factory.

Factors contributing to the Army decision to cut off the H-21 apparently include shortage of funds and personnel, comparative evaluation of the H-21 and the H-34 and some change in basic concept.

Current trend in the Army is to favor smaller helicopters and more of them, a sharp shift away from the enthusiasm for bigger rotary wing aircraft that was prevalent about five years ago. Experience has shown that maintainability gets lower and costs increase at a fast rate with larger helicopters. In addition, smaller ones probably are more agile and less vulnerable to enemy fire.

Evaluation of the H-21 and Sikorsky's H-34 was conducted by the Army Aviation Board at Ft. Rucker, Ala. The report was never made public but it is known to have favored the Sikorsky aircraft. Further comparative studies were made in Algeria by the French Army (AW Sept. 17, 1956, p. 28).

Guggenheim Fellowships

Applications for fellowships in jet propulsion and flight structures are now being accepted by the Guggenheim Foundation. This year, 20 fellowships are being offered which include tuition plus expenses from $1,200 to $2,000.

The graduate studies in jet propulsion will be pursued at California Institute of Technology and Princeton University; those in flight structures will be at Columbia University. Candidates must hold engineering or scientific degrees, have outstanding technical ability and special interest in the field of study.

Applications must be received by March 1. Candidates will be notified in early April. Applications, available from university deans, plant supervisors, commanding officers, technical societies and directly from the foundation, should be sent to: the Guggenheim Foundation, 120 Broadway, New York 5, N. Y.

'Open Skies' Exhibit Arrives in Europe

London—The United States brought its 'open skies for peace' exhibition to Europe this week for the first time.

The exhibit, stressing the U. S. proposal for aerial reconnaissance as part of world disarmament, is starting a six month tour of Britain at a cost of $28,000. It will then visit the continent. It is designed to show how effective aerial inspection can be.

American Ambassador Winthrop Aldrich opened the 3,000 sq. ft. exhibition.

Kollsman Receives $26 Million Contract

Kollsman Instrument Corp. has received a $26 million contract for production of a new Automatic Astro Compass developed for the Air Research and Development Command to increase strategic effectiveness of high speed, long-range aircraft. An ARDC spokesman says the compass automatically tracks celestial bodies and computes precise aircraft direction.

NORTHROP F-89C Scorpion has specially modified nose to gather vital information in crosswind ballistics test at Air Research and Development Command's Air Force Armament Center. Trajectory of a projectile fired downward from gun located in housing underneath nose will be pinpointed by readings from instrumentation in the aircraft and on the ground.

Crosswind Firing Test to Aid B-58

Eglin AFB, Fla.—Accuracy of the USAF-General Electric 20-mm. Vulcan aircraft cannon in crosswind firing is being measured here in a unique test that will help determine how much more flexibility has been built into the tail turret of the supersonic Convair B-58 Hustler bomber.

Flexibility of the B-58 turret is greater than in other bombers, giving more protection against side attacks. But ballistics theory must be refined to insure accuracy in firing across the windstream. The test will help to check the accuracy of calculations based on wind tunnel and ground firing tests.

Test firing is done at night from 40,000 ft. by a Northrop F-89C Scorpion with a specially modified nose (similar to the one in picture above). A housing containing the cannon and instrumentation points downward from the nose.

Each time the Scorpion passes over the range, a single projectile is fired. Simultaneously, an especially designed microflash unit on the plane emits a flash of light. At a predetermined time after firing, the incendiary projectile explodes.

Four ballistic ground cameras, whose optical axes have been determined by star fixes, record the exact point of firing and the point of explosion, while a camera in the plane records the direction of firing. From this data, the trajectory is determined, giving the information necessary for final calculation of firing tables.

In spite of the 40,000-ft. altitude, position of the shell will be determined within a two-foot radius.

The test is being conducted by the Ballistics Directorate of the Air Research and Development Command's Air Force Armament Center. The directorate devised new techniques and instrumentation for the tests.

Pilot for the testing is Capt. Robert Herman. His radar observer is Lt. Ben Chartier.

Army Gets Exemption

Washington—Defense Secretary Charles E. Wilson has given his official blessing to an Army program to acquire a high performance observation aircraft.

Wilson will allow the joint Army-Navy development project for such an aircraft to continue, and the ground forces can buy five aircraft for test and evaluation.

Nine contractors have submitted 11 designs in the competition and a decision on the winner is expected within 30 days.

The Wilson decision marks the second exception he has allowed to the 5,000-lb. limit set for Army fixed wing aircraft. The first was his approval of the purchase of five de Havilland Twin Otters.

New AIA Head Details Problems, Will Visit 100 Industry Plants

By Claude Witze

Washington—Gen Orval R Cook, new president of the Aircraft Industries Assn, will start next week on a tour of more than 100 aircraft and component manufacturing plants

An active pilot for 33 years, former USAF deputy chief of staff for materiel and co-author of the Cook Craigie Aircraft Production Plan, Gen Cook will use the trip to orient himself to his new job and renew friendships in the industry Most of these contracts go back almost 30 years, to the time when he was assigned to the Army Air Forces Materiel Center in Dayton

In the early 1930s, Gen Cook worked with such industry leaders as J H "Dutch" Kindelberger, now president of North American Aviation, and Glenn L. Martin At that time, Gen Cook was in charge of the Army Air Force's research and development on propellers He worked with the industry toward perfection of both controllable pitch and hollow blade propellers

A maintenance officer as early as his student flying days at Brooks and Kelly Fields, Gen Cook told Aviation Week he is still vitally concerned with the growing military problem in this area

He cited the constant level military budget increasingly complicated and more expensive weapon systems the problem of retaining skilled personnel and the need for easier maintainability as major fields of endeavor in his new position

Major Problems Ahead

For the industry, Gen Cook feels improving design to simplify maintenance can complicate manufacture, slow development and bring higher initial costs At the same time, these improvements are necessary to help the armed forces meet their requirements and must be built into the systems in the best possible way

For the future, Gen Cook predicts that a major industry problem will be continued emphasis upon costs He anticipates this issue will become even more important as the military budget is divided more evenly between conventional aircraft and missiles

He points out there will be a time, with budget ceilings continuing to dictate procurement programs, when the Defense Department will be forced to ask how many units of an expendable weapon it can afford to buy Minimum costs will be essential Gen Cook says, if the arsenal of missiles is not to be limited by high unit costs He expects strong pressure on the industry to make missiles cheaper as well as more reliable

Pentagon reaction to the choice of Gen Cook to lead AIA is enthusiastic—at least in part because of his familiarity with USAF's problems and the knowledge that he will do what he can to help solve them This feeling is not confined to his former colleagues in the Air Force During his Pentagon career, Gen Cook was one USAF executive whose appointment to joint committees almost always won the favor of Navy and Army officers, who were confident of the general's fairness

Regarded Highly

During his post-war Air Materiel Command assignments, Gen Cook worked closely with the Navy's Bureau of Aeronautics on inter-service procurement and production problems, and is highly regarded by the top ranking Navy admirals who worked with him in that period

The men in USAF who worked closely with Gen Cook have a high regard for him

"He was austere, a master manager," a high-ranking procurement officer recalls "Nothing was done on a crisis basis It proceeded in an orderly way after the general had listened to all the facts. He was noted for his fairness and objectivity and set a standard of integrity that probably is the highest I have seen in the service"

This officer said AIA's choice of a new president is "ideal" because Gen Cook holds the equally high respect of both military and industry leaders

The respect was not won easily In his tenure as deputy chief of staff for materiel, Gen Cook had his share of incidents in which it was necessary to take a stern attitude toward industry His AIA appointment attests that he retained the industry's respect in spite of this

Most spectacular case in this period was in the spring of 1953 when the Kaiser-Frazer Corp came under fire for excessive costs in its production of the C-119 Called before a Senate Armed Services Subcommittee Gen Cook did not hesitate to testify he was "frankly disappointed" with the contractor's performance

At the same time, he took the opportunity to tell Capitol Hill in firm words that production highs and lows are mainly responsible for waste in aircraft procurement programs He demanded a firm policy to assure steady production

"With a regulated system of letting contracts" he said "we would have a long-range procurement policy and a fixed purchasing policy"

He made it clear to Congress that the cutbacks and orders to build up for emergencies such as the Korean War are their responsibility "At Willow Run" he pointed out, "we were not buying only aircraft, we were buying insurance against World War III" He said Kaiser-Frazer got the C-119 contract as a second source producer only because it had the Willow Run facility which had been used by Ford Motor Co to build B-24s during World War II

Cook-Craigie Plan

The following year Gen Cook's name was linked with Gen Laurence Craigie's as developer of a new production program designed to cut costs and insure smoother technical development Basic feature of the Cook-Craigie plan is a delay in production of a new weapon system—holding it to less than five a month for an 18 to 24-month period—until an extensive test program is completed

After major bugs in the system are located and corrected the go-ahead is given The result is a big saving in retro-fit and modifications

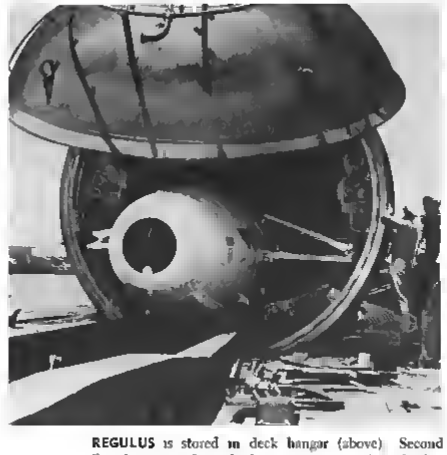
Gen Cook was born in West Union, Ind, on July 28 1898 and was graduated from West Point as a second lieutenant in the Air Service in 1922

He was first assigned to engineering section of the production division at the Army Air Forces Materiel Center

GEN. ORVAL R. COOK, former USAF deputy chief of staff for materiel, is new president of Aircraft Industries Assn succeeding Adm Dewitt C Ramsey (AW Jan 7, p 25) Adm Ramsey will remain with AIA as vice chairman of board of governors. The move was predicted first by Aviation Week last Aug 27 (p 25)

Regulus I Missiles Loaded Aboard Tunny

LOADING and deck handling of Regulus I missile are demonstrated aboard submarine Tunny Wings folded missile is lowered to deck (above left) It has no wheels, stands on detachable slippers visible on belly Two JATO bottles (above) give J33 turbojet-powered missile initial flying speed Here missile is being positioned on launcher, prior to raising into launching position and firing (AW Nov 19, p 33).



REGULUS is stored in deck hangar (above) Second Regulus is stored upside down in upper section of extender (right) Inside wall of hangar rotates to bring second missile into position for launching Chance Vought has developed successor, Regulus 2.

in Dayton in 1939. By April 1942, he was chief of the section. He became supervisor of the Eastern Procurement District in 1942. In May of 1943, Gen. Cook became chief of the Production Division, AAF Materiel Command Headquarters. After a period of service in the Far East, he was chosen Director of Procurement and Industrial Mobilization Planning at Air Materiel Command in July 1948.

Gen. Cook was deputy chief of staff for materiel at the Pentagon from July 1951 until February 1954, when he went abroad as Deputy Commander in Chief, U.S. European Command. He held this job until he retired from the Air Force last May.

Gen. Cook has been awarded the Distinguished Service Medal and the Legion of Merit. He is rated a command pilot, combat observer and aircraft observer.

He and his wife have three sons. They live in Falls Church, Va.

Hawker Siddeley Expanding Facilities

London—The Hawker Siddeley group will expand aircraft technical facilities in Britain and overseas. Sir Thomas Sopwith, chairman, said in the group's annual report the expansion is necessary because without it "it is impossible to survive in this fast-moving technical world."

Sir Thomas said the group profit for the year was $26,726,013, and announced an annual dividend totaling 10%.

He listed these new manufacturing and test facilities:

- **A. V. Roe** is erecting a facility for investigating heat barrier problems. The building is to be completed early this year.
- **Hawker Aircraft** is expanding facilities for its research and development teams.
- **Armstrong Whitworth** is increasing its research facilities for both aircraft and guided missiles. These will include a laboratory for simulation of guided missile launching and flight.
- **Armstrong Siddeley Motors** is completing an establishment for research and development work on gas turbines and rocket motors.
- **Orenda** engine test facilities in Canada are being expanded to handle an intensive program on the Iroquois engine.

Sir Thomas said atomic energy contracts have been awarded to the year-old Hawker Siddeley Nuclear Power Co. which is concentrating on liquid metal reactors.

He gave no further details on the reactor program.

The Hawker Siddeley chairman said the group now has produced more than 44,000 aircraft and that Armstrong Siddeley turbojet and turboprop engines are flying in 23 types of British and foreign military aircraft.

A number of airlines have expressed interest in the projected Armstrong Whitworth freight/passenger transport and the company is confident that there is a world-wide civil transport market for this aircraft.

HF Communications

Pros and cons of three new types of HF communications systems being considered as military-airline replacements for presently used amplitude modulation (AM), will be debated at a technical symposium sponsored by Aeronautical Radio Inc. to be held Feb. 1 at the Hotel Statler in Washington.

Ernest Pappenfus of Collins Radio will speak in favor of single sideband, Dr. John P. Costas of General Electric in behalf of synchronous detection and Leonard Kahn of Kahn Research Laboratories will support a compatible single sideband system (AW Dec. 24, 1956, p. 39).

Fourth panel member, an independent consultant from Stanford Research Institute, will be John Honey.

News Digest

J. Mills Summers, 68, founder and president of the Camloc Fastener Corp. died Jan. 4. Though he studied architectural engineering at Cornell University, Summers turned to freight car design (first successful all steel boxcar and an ore car still in use at the Mesabi Range) and later to sales management. Aircraft fasteners he saw as an airline passenger in the 1930s challenged his inventiveness, and he set out to try to improve them. Basic design of the Camloc Fastener was completed in 1938, and he founded the company in partnership with his wife to develop the idea. The company moved into production in World War 2, and has expanded since.

Grumman Aircraft Engineering Corp. has an option to negotiate a license for the production of an Americanized version of the French Fouga CM-170 (Magister) twin-jet primary and basic trainer. The airplane has been demonstrated to Armed Forces training chiefs, and pilots who have flown it feel that it could be the answer to jet flying training in the early stages in its present form. The Magister is powered by two J69 turbojets, each developing 900 lb. thrust, giving a maximum speed of 400 kt., an operating altitude of 20,000 ft., and a maximum ceiling of 40,000 ft.

Employment in Pratt & Whitney Aircraft's Connecticut facilities has now reached 40,000. Leonard C. Mallet, general manager of the the company, said an additional 5,000 employes will be needed in 1957. Since July, 3,000 have been hired. Pratt & Whitney facilities, centered in Hartford, are spread through 12 other Connecticut towns.

Air Vice-Marshal F. R. W. Scherger will succeed Air Marshal Sir John McCauley as head of the RAAF starting March 18, 1957. Scherger has been head of the Australian Joint Services Staff in Washington.

Lycoming's T53 powered Kaman HOK helicopter will undergo six month experimental flight test program at Stratford, Conn., following recent completion of 50-hr. tie down test at Bloomfield, Conn. Engine also has undergone flight testing in Bell XH-40.

Minneapolis-Honeywell Regulator Co. was awarded half million dollar study contract by Air Research and Development Command to develop new type of air-to-ground rocket. Primary responsibility, to include design, mock-ups and wind tunnel models will go to Aeronautical Division's Missile Controls Center at Los Angeles. Work on project will be carried out with Air Force's Armament Center at Eglin Air Force Base, Fla. Rocket will be suitable for delivery by fighter aircraft.

Navy Bureau of Aeronautics awarded Kaman contract for additional HOK-1 helicopters for rescue and general utility operations on carriers. HOK-1s currently being produced by Kaman are for Marine Corps.

Bendix Aviation Corp. has received a $27 million Navy contract to produce the Navy developed Talos anti-aircraft missile. The ramjet-powered Talos will be built by Bendix Products Division at the Naval Industrial Reserve Ordnance Plant in Mishawaka, Ind. Navy is now planning to arm the cruisers Galveston and Little Rock with Talos sometime next year.

Air Force has awarded Bell Aircraft Corp. a $405,000 contract for various test equipment to be used in the Rascal air-to-ground missile reliability program.

English Electric Co. now has produced more than 500 Canberra bombers. Lord Caldecote, director of the firm, reported there still are substantial existing orders and the company can foresee others which will keep the Canberra production line going "for several years to come."

TCA Picked Vanguard for Economy

Trans-Canada Air Lines decided after two-year study that turboprop costs were less than those of pure jet.

By Glenn Garrison

New York—Trans Canada Air Lines analyzed seven turbojet and turboprop aircraft during a two-year evaluation program before deciding to augment its fleet with Vickers Vanguards (AW Jan 7, p 38). Choice of the turboprop over a medium straight jet was made after it was concluded that TCA's particular route and traffic requirements gave an $8 million annual advantage to the Vanguard over its nearest all-jet competitor.

The airline's second choice was the Douglas DC-9. With four big DC-8s on order, TCA would have liked very much to buy the medium Douglas jets for a completely integrated, propellerless fleet. But the carrier's studies showed, according to J. T. Dyment, director of engineering, that turbojet cost curves rose sharply above turboprop costs on stage lengths of 700 mi. or less.

Trans Canada's average route length from a traffic standpoint is 380 mi., Dyment said. Heavy concentrations of traffic on such segments as New York to Toronto and Montreal are responsible for this.

The $8 million estimate represents the annual difference in direct operating costs and potential revenues and assumes mixed class use of the Vanguard. TCA's Vanguards will carry between 82 and 102 passengers, while the DC-9 probably will have a smaller capacity.

Also competing for TCA's order was another turboprop, the Lockheed Electra; two other American medium jet designs, the Convair 880 and Boeing 727; the Comet IV, and the already flying Caravelle.

Advantages

Advantages of the Vanguard over the Electra, for TCA requirements, included larger size and greater flexibility between passenger and cargo operations.

TCA prefers the Rolls Royce Tyne 2 engines, which will go into its Vanguards, to the Allison engines which will power Electras ordered by American carriers. Lockheed would have put Tynes into Electras for TCA, but the price would go up, and the other Vanguard advantages for TCA's uses would still pertain.

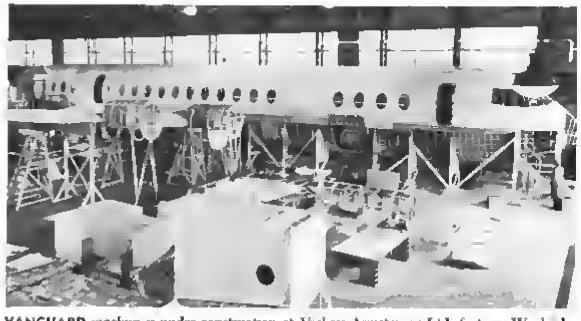
Allison engines would be considerably less expensive to buy and maintain than Tynes, according to Dyment, if the costs projected for the American engine are realistic. But he questions whether this is so. If the Allison costs prove out as predicted, and the Rolls Royce figures have erred on the pessimistic side, the Tyne buyer still will be in a better position, according to TCA's view.

Evaluation

Engine materials are an increasingly important cost factor in airline operation, according to Dyment. Even more important is aircraft first cost, now accounting for a third of direct operating costs. Fuel cost accounts for another third, and "all the rest," with engine materials at the top, make up the other third.

Trans-Canada evaluated Vanguard's potential with the Tyne 2 as the assumed powerplant, and should be in even more favorable position when the Tyne 3 comes along. Dyment said the Tyne 3 will add about 20 mph. to the aircraft's speed, bringing it up to 440.

A big selling point of the Vanguard with TCA was the plane's "double bubble" fuselage with lower cargo section. This feature of the aircraft, which allows all-cargo use with a 10-ton payload without disturbing passenger seats, in effect adds four all-cargo planes to TCA's fleet. It also will end the airline's problems in handling mail in combination with passengers at certain hours, a problem that has often plagued TCA in its Viscount operation. The Electra, in Dyment's view, also would fall short of the Vanguard in handling heavy mail.



VANGUARD mockup is under construction at Vickers Armstrongs Ltd. factory, Weybridge (below). Wooden mockup is of full scale dimensions. First flights of the turboprop airliner are scheduled for fall, 1958. British European Airways has ordered 20 Vanguards with deliveries to begin in spring 1960. Aircraft in drawing (top photo) bears BEA markings. Trans Canada Airlines has ordered 20 Vanguards.

loads along with passengers.

Canada's air cargo traffic is operationally difficult because of scattered population centers and "one way street" flows of cargo.

The Vanguard is especially well suited to this kind of operation because it can fly an all-cargo load on a long non-stop overnight haul, unload, and take on a return load of passengers without any conversion necessary.

Each of the competing manufacturers offered TCA an all-cargo version of its aircraft, and the airline probably will buy about four all-cargo Vanguards with oversized doors within a year after the passenger fleet is in operation. The Vanguard's big cargo belly costs only three or four knots in flying speed, according to Dyment.

Cockpit Layout

Another attraction of the Vickers plane was the simple cockpit. There is no excuse for complexity of cockpit in the new aircraft types, Dyment said, and he "can't understand the thinking of people who are frightened by this turbine stuff who believe they need more people on them." Carrying a flight engineer on such airplanes, Dyment said, would be "featherbedding."

Payload of TCA Vanguards actually could be 26,000 lb. instead of the announced 24,000, according to Dyment. TCA has made allowance, however, for possible future equipment such as weather teletype or air traffic control radar. Also, the aircraft could accommodate as many as 122 passengers if used in high density service.

TCA Competition

TCA probably will be competing with American Airlines and Eastern Air Lines Electras on the transborder segments, and the Electras will be delivered earlier than the Vickers planes. Schedule-wise, Dyment doesn't believe there will be much difference in the airlines' services. Even straight jets would cut the New York-Toronto time by only 15 minutes, he says. TCA expects elapsed time of its Vanguard flights between those two cities to be an hour and 15 minutes.

TCA's traffic between New York and Canada is estimated at 2,000 passengers daily when the Vanguards go into service, some time after initial deliveries in late 1960.

Ill Wind

London—British European Airways says that one effect of Britain's gasoline shortage is that more people are flying.

The airline reports an increase in passenger traffic on its short domestic routes since gas rationing started after the Suez crisis in December.

Helicopters Help Untangle Traffic

New York—Use of helicopters to aid in easing bus tieups on this city's streets was tested by the Transit Authority with a borrowed Port of New York Authority Bell 47-G. Transit officials observed traffic conditions from the Bell, communicating with ground control cars below.

An aerial helicopter patrol, according to the Transit Authority, would make it possible to spot congested points and bus bunching, permit rerouting of buses around the areas, or turn them short of their destinations. Authority General Manager Thomas J. McLernon sees good possibilities in the idea and plans further experiments. Within the next week or two, McLernon said, another test will be made after numerals are painted on the tops of some buses for spotting purposes.

About six helicopters would be required to do the patrol job, according to McLernon.

Photograph of the helicopter carrying out last month's experiment (below) seems to show the Bell at low altitude over Manhattan's streets.

The Bell actually is over water just off the shoreline of the Battery, according to its pilot, Ray Chasson. Shot was made from a Trap Rock Corporation helicopter flying above the Port Authority machine.

Over Manhattan proper, Port Authority and New York Airways helicopters have been following a 1,500-ft. minimum altitude.

Bus stations along the east side of the city were observed at lower altitudes, according to Chasson, by staying within autorotation distance of the East River and Harlem River.

Crossing Brooklyn, he took the Bell to 1,500 feet for observation of the buses in traffic.

NEW YORK Transit Authority Dispatcher William Newman (left) at Battery with walkie-talkie checks with helicopter observer on how buses are running. Port Authority helicopter (right) tracks buses at Battery in effort to determine why they unfailingly gather in convoys. Helicopter actually is over water near the Battery shoreline.

Tu-104 Arrives in Siberia

Russian Tu-104 jet airliner is parked at ramp at Khabarovsk Airport in Siberia, marking inauguration of regular service on a 5,220 mi. route from Moscow. Flying at 29,500-32,800 ft. the Tu-104 averaged 565 mph. First leg of route, Moscow-Sverdlovsk—comparable to a non-stop flight of 1,200 mi. Boston to Miami—was flown in 2 hr. 14 min. Second leg, from Sverdlovsk to Irkutsk—comparable to Atlanta-San Francisco non-stop—a 2,100 mi. stage, was flown in 3 hr. 50 min. The final leg to Khabarovsk, comparable to the 1,700 mi. from Chicago to Seattle, required 3 hr. 12 min.

House Group Proposes Shift in CAB Control

Washington—House Small Business Committee has recommended shifting administrative control over the Civil Aeronautics Board from the President to Congress.

The group, headed by Rep. Wright Patman (D.-Tex.), urged the House and Senate Commerce Committees to consider legislation providing that:

- **Chairman will** be selected by CAB members instead of appointed by the President,
- **CAB money requests** be submitted directly to Congress instead of to the Bureau of the Budget, which is an agency of the White House.
- **CAB legislative recommendations** go directly to Congress without the requirement for Budget Bureau clearance.

The committee argued that CAB lacks the "independence" from White House control of two other quasi-judicial agencies whose members select their own chairman—the Interstate Commerce Commission and Federal Communications Commission. The CAB Chairman's authority to appoint an executive director also increases White House control indirectly, the committee said.

By "drastically" scaling down the money requests of CAB and other regulatory agencies, the committee charged, the Budget Bureau "has established itself as the judge of how much regulating of interstate commerce it will permit . . . It has precluded these agencies from requesting the Congress to appropriate what the agencies themselves have believed necessary to serve the public interest."

Although CAB and other regulatory agencies were established as arms of Congress, the committee protested they have "so far fallen under the influence and control of the executive branch, that the heads, appointed by the Chief Executive, have no hesitation in turning to the executive branch for advice, counsel and opinion . . . ."

Gewirtz Leaves ATA, Joins National Airlines

Washington—Stanley Gewirtz resigned last week as vice president and assistant to the president of the Air Transport Assn., in order to become vice president of National Airlines.

In other executive moves, G. T. Baker, National president, announced the election of Richard A. Fitzgerald, assistant vice president in Washington, to a full vice presidency. William Caldwell, Jr., was promoted to assistant treasurer from his position as director of economic research.

Prior to joining ATA, Gewirtz was executive assistant to two Civil Aeronautics Board chairmen, James M. Landis and Joseph F. O'Connell. He was graduated from New York University and Harvard University Law School and is a veteran of World War II. Both Gewirtz and Caldwell will be located at National's executive offices in Miami.

Intercity Passenger Miles for 1956

Intercity passenger-miles flown by U. S. scheduled airlines increased by 13.7% last year while both the railroad and bus industries were registering declines. A comparative breakdown follows:

INTERCITY COMMON CARRIER
Passenger-Miles for 1956
(000 Omitted)

	1956	1955	Percent Change
SCHEDULED AIRLINES			
First-Class	14,602,000	13,025,000	12.1
Coach	7,835,000	6,717,000	16.9
Total	22,455,000	19,742,000	13.7
CLASS 1 RAILWAY			
First-Class	6,407,000	6,441,000	-.5
Coach	17,219,000	17,314,000	-.5
Total	23,626,000	23,755,000	-.5
MOTOR BUS	15,747,000	16,489,000	-0.5
COMMON CARRIER—TOTAL	61,828,000	59,986,000	3.1
PRIVATE AUTOMOBILE	621,000,000	585,600,000	6.0

Compiled by the Air Transport Assn. from official CAB and ICC reports.

CAB Reorganizes, Post Abolished

Washington—Civil Aeronautics Board last week announced a three-way staff and departmental reorganization designed to tighten regulatory supervision of airline operations.

Board Chairman James R Durfee said the reorganization was necessary in order to meet the needs of the fast growing airline industry. Principal changes under the plan:

- **Abolishment of the Office of Executive Director** upon the recommendation of Raymond Sawyer who has held the post since 1953. Functions of the office have been transferred to Robert L Kunzig, legal advisor and assistant to Chairman Durfee. Kunzig's new title will be executive director and legal advisor to the chairman.
- **Sawyer has been reassigned** to one of two new positions under the director of the Bureau of Air Operations. He will handle functions involving U S flag carriers, foreign airlines and international air agreements as associate director (international). His counterpart will be Irving Roth, former chief of the rates division, who will take over the position of associate director (domestic) in charge of domestic airline operations. The position of associate director previously held by R Vernon Radcliffe, who recently joined Trans World Airlines will be eliminated.
- **Bureaus of Safety Regulation and** Safety Investigation have been combined into one overall Bureau of Safety to be headed by Oscar Bakke, who has served as director of the Bureau of Safety Regulations. Two new positions in the Bureau of Safety, neither of which have been filled, were created by the CAB—associate director (regulations) and associate director (investigation).

Title of Secretary of the Board, now held by M C Mulligan, has been changed to secretary and comptroller.

Alaska, Hawaii Lines Win CAB Certificates

Washington—Seven Alaskan airlines and one Hawaiian airline were awarded permanent certificates last week by the Civil Aeronautics Board to bring the total of permanently certificated U S air carriers to 38.

The Board action is the result of legislation passed by Congress last July which directed the Board to grant permanent certificates to local service airlines. All carriers involved have been operating under temporary authorization.

Airlines receiving permanent certificates, which are effective immediately, are Alaska Airlines, Alaska Coastal Airlines, Cordova Airlines, Ellis Air Lines, Northern Consolidated Airlines, Reeve Aleutian Airways, Wien Alaska Airlines and Trans-Pacific Airlines (Hawaii).

Airline Revenues—1956

(000 Omitted)

	1956	1955	Percent Increase
DOMESTIC TRUNK			
Passenger	$1,139,366	$1,021,853	11 5
Mail	31 846	26 938	15 2
Express	19 307	19,404	— 5
Freight	41 164	39 604	3 9
Other	25 486	22 356	13 7
Operating Revenues	1,264 295	1,130 155	11 2
Public Service	2,756	3,192	—13 7
Total Revenues	$1,259,051	$1,133,347	11 1
LOCAL SERVICE			
Passenger	$40,477	$32,641	23 2
Mail	1,642	1,185	—15 5
Express	848	664	27 7
Freight	722	555	30 1
Other	1,375	1 283	7 2
Operating Revenues	44,424	36,528	21 6
Public Service	22,381	20 714	8 0
Total Revenues	$66,805	$57,242	16 7
HELICOPTER			
Passenger	$429	$208	106 3
Mail	223	250	—10 8
Express	136	100	36 0
Freight	28	23	21 7
Other	69	64	7 8
Operating Revenues	885	645	37 2
Public Service	2,673	2,710	—1 4
Total Revenues	$3 558	$3 355	6 1
TOTAL DOMESTIC INDUSTRY			
Passenger	$1,180,272	$1,054 902	11 9
Mail	32 271	28 373	13 7
Express	20 291	20 168	6
Freight	41 918	40 182	4 3
Other	26 852	23 703	13.3
Operating Revenues	1 301,644	1,167,328	11,5
Public Service	27,810	26,616	4 5
Total Revenues	$1,329,414	$1,193,944	11 3
INTERNATIONAL			
Passenger	$340,379	$294 828	15 5
Mail	27 675	25 639	5 6
Express / Freight	36,647	31,930	15 4
Other	37 981	30,324	25 3
Operating Revenues	442,282	382 721	15 6
Public Service	1,614	1,583	2 0
Total Revenues	$443,896	$384 304	15 5

	1956	1955	Percent Increase
ALASKAN			
Passenger	$10,333	$8 162	26 6
Mail	2,495	2,333	6 9
Express / Freight	2,767	2,464	12 3
Other	8,013	3,747	113 9
Operating Revenues	23,608	16,706	41 3
Public Service	5 927	5,618	5 5
Total Revenues	$29,535	$22,324	32 3
TERRITORIAL			
Passenger	$6,058	$5 686	6 5
Mail	50	47	6 4
Express / Freight	779	752	3 6
Other	252	338	—25 5
Operating Revenues	7,139	6,823	4 6
Public Service	263	291	—9 6
Total Revenues	$7,402	$7,114	4 0
TOTAL INTERNATIONAL AND OVERSEAS			
Passenger	$356,770	$308 676	15 6
Mail	29,620	28,019	5 7
Express / Freight	40,393	35 146	14 9
Other	46 246	34 409	34 4
Operating Revenues	473 029	406 250	16 4
Public Service	7,804	7 492	4 2
Total Revenues	$486 833	$413,742	16 2
ALL CARGO			
Passenger			
Mail	250	57	338 6
Express	177		
Freight	21,858	18,634	17 3
Other	23,699	8 336	184 3
Operating Revenues	45,984	27 027	70 1
Public Service			
Total Revenues	$45,964	$27,027	76 1
TOTAL SCHEDULED AIRLINE INDUSTRY (Including All Cargo)			
Passenger	$1,537 042	$1,363,578	12 7
Mail	62 141	56 449	10 1
Express	20 469	20,168	1 5
Freight	104 169	93 962	10 9
Other	96,797	66,448	45 7
Operating Revenues	1,820 617	1,600,605	13 7
Public Service	35,614	34 108	4 4
Total Revenues	$1,856,231	$1,634,713	13 6

Compiled by Air Transport Assn. Revenue estimates based on nine months actual data.

LaGuardia Improvement Planned

New York—Agreement among airlines and the Port of New York Authority on a $30 40 million rehabilitation of LaGuardia Airport is expected soon. Final decisions on how the field will be used and its renovation paid for are still under negotiation, but a general plan for its physical improvement has been drawn up.

Several major projects are called for in the program, which should approach in cost the original $39 million construction of the airport on filled land:

- **Expansion of** the existing main terminal building and construction of new fingers leading from the terminal to the passenger loading area. The fingers would be of two-story construction to separate incoming and outgoing passengers.

The existing automobile parking space on either side of the present terminal building also would be utilized for the proposed terminal expansion.

- **Filling of the lagoon** between the present terminal and east hangars and Grand Central Parkway to recoup the lost parking space and to accommodate a heliport.
- **Complete resurfacing** of all runways and taxiways.

The new fingers would provide a total of about 40 gate positions, compared with 24 now in use along the single story passageway that is connected to the terminal building.

Port Authority and the airlines have been discussing a LaGuardia improvement program for many months. The Authority said last week that "no agreements with the airlines, either formal or informal" had been reached on the "highly involved and complicated" problem.

Actual agreement depends in part upon lease re-negotiations with some airlines, including Eastern and American.

Besides the financial considerations involved, LaGuardia's future runway weight capacity is an issue in view of forthcoming use of the Lockheed Electra. The airport, under regional plans, will not be used for long-range pure jets. Present weight limitation is 105,000 lb.

Bradley Nash Named Commerce Assistant

Bradley Nash, former USAF Deputy Assistant Secretary for Civil Aviation, was sworn in last week as Deputy Under Secretary of Commerce for Transportation by Commerce Secretary Sinclair Weeks. Nash succeeds Brig Gen Thomas Bayne Wilson, who resigned on Jan 5 to enter private business.

Nash has held a number of government posts, including an assignment as assistant to Commerce Secretary Herbert Hoover in 1927. Later he was named financial consultant with the Reconstruction Finance Corp and, before joining the Army in 1942, served as Director of Finance for the War Production Board. In 1953, he was a consultant to the Advisory Committee on Government Organization.

Airline Traffic—1956

(000 Omitted)

	1956	1955	Percent Increase
DOMESTIC TRUNK			
Revenue Passenger-Miles	21,811 993	19,217,615	13 5
Mail Ton-Miles*	92 900	86 034	8 0
Express Ton-Miles	52,775	64 648	6 4
Freight Ton-Miles	191,745	174,023	10 1
Revenue Ton-Miles	2,462,927	2,190 640	13 3
LOCAL SERVICE			
Revenue Passenger-Miles	641,040	523,298	22 5
Mail Ton-Miles*	1 511	1 257	20 2
Express Ton-Miles	1 827	1,427	28 0
Freight Ton-Miles	1,667	1,391	19 8
Revenue Ton-Miles	67,245	55,040	22 2
HELICOPTER			
Revenue Passenger-Miles	1,592	628	153 5
Mail Ton-Miles*	88	96	—8 3
Express Ton-Miles	34	31	9 7
Freight Ton-Miles	7	5	40 0
Revenue Ton-Miles	280	192	45 8
TOTAL DOMESTIC INDUSTRY			
Revenue Passenger-Miles	22,454,625	19,741,541	13 7
Mail Ton-Miles*	94 499	87 387	8 1
Express Ton-Miles	54,636	51 066	7 6
Freight Ton-Miles	193 419	175,419	10 3
Revenue Ton-Miles	2,550,452	2,245,872	13 6
INTERNATIONAL			
Revenue Passenger-Miles	5,882,680	4,409 621	15 2
Mail Ton-Miles*	56 785	52 409	8 3
Express Ton-Miles / Freight Ton-Miles	107,403	89,641	19 6
Revenue Ton-Miles	720,904	622,406	15 8

	1956	1955	Percent Increase
ALASKAN			
Revenue Passenger-Miles	164,250	110,403	27 0
Mail Ton-Miles*	2,438	2,379	2 5
Express Ton-Miles / Freight Ton-Miles	7,997	7,300	9 5
Revenue Ton-Miles	46,459	29,353	58 3
TERRITORIAL			
Revenue Passenger-Miles	84,029	78,164	7 6
Mail Ton-Miles*	64	58	10 3
Express Ton-Miles / Freight Ton-Miles	1,646	1,646	—8 5
Revenue Ton-Miles	8,940	8,759	2 1
TOTAL INTERNATIONAL & OVERSEAS			
Revenue Passenger-Miles	5,306,367	4,598,154	15 4
Mail Ton-Miles*	59,287	54,846	8 1
Express Ton-Miles / Freight Ton-Miles	116 908	98,787	18 3
Revenue Ton-Miles	776,303	660,513	17 5
ALL CARGO			
Mail Ton-Miles	1,174	322	264 6
Express Ton-Miles	832		
Freight Ton-Miles	127,116	108 920	16 7
Revenue Ton-Miles	244,149	136 000	79 5
TOTAL SCHEDULED AIRLINE INDUSTRY (Including All Cargo)			
Revenue Passenger-Miles	27,760,992	24,339,695	14 1
Mail Ton-Miles*	154,964	142,555	8 7
Express Ton-Miles	55,468	51,064	8 6
Freight Ton-Miles	437,437	383 126	14 2
Revenue Ton-Miles	3,570,904	3,042,390	17 4

*Includes U. S mail only

Compiled by Air Transport Assn. Traffic estimates based on 10 months actual data

East German Lufthansa Reduces Fares

Bonn—East German Lufthansa has issued a new timetable quoting air fares that undercut established International Air Transport Assn. fares by almost 50%.

The state owned East German airline has published passenger tariffs from Berlin to New York—primarily via connecting transatlantic lines—at sharply reduced rates for first-class flights. Fares from Berlin to Rio de Janeiro and Mexico City are quoted at similarly low rates.

In addition to the cut-rates, tickets purchased from the airline for flights from Berlin to New York could conceivably cost as little as $70.50 in view of the unrealistically high peg of the East German mark in relation to West Germany's Deutschemark. All prices in the timetable are quoted in Deutschemarks.

EAST LUFTHANSA operates Russian-built 30-passenger Il-14s on Berlin-Moscow Route.

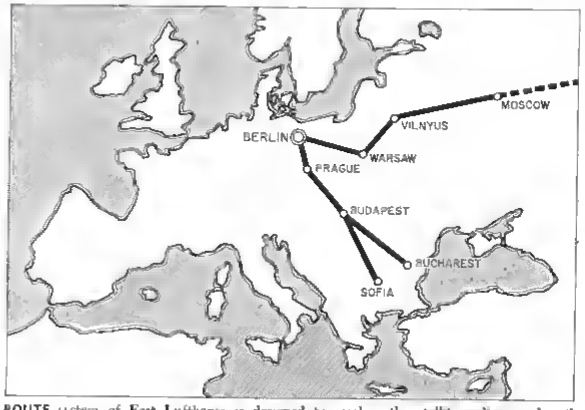
Danger of Loss

The low tariffs could create a substantial loss for East Lufthansa since the airline is charged the full amount of the standard IATA fares by carriers accepting tickets sold by the line. Only revenue East Lufthansa can expect to earn in such transactions is on the portion from Berlin to Prague. From there, passengers can transfer from the East German airline to KLM for the flight to New York via Amsterdam.

The unusual situation is further complicated by a listing in the timetable of several international carriers as "booking agents" for the company. All of them deny the existence of any interline contracts, although several admit negotiations have been conducted with such a plan in view (AW Dec. 10, p. 40).

West German Lufthansa which has raised strong objections to the use of its patented name and similar insignia by the East German line, has protested to other airlines that booking agent contracts violate its trade name rights in the Western Hemisphere. As a result most discussions with East German Lufthansa have been dropped by the carriers involved.

West German Lufthansa apparently has not opposed the "general agency agreement" reportedly in effect between KLM Royal Dutch Airlines and East Deutsche Lufthansa. Other general agents listed in the timetable in addition to KLM are Aeroflot, Soviet Air Lines, LOT, Polish Air Lines, CSA, Czechoslovakian Air Lines, MALEV, Hungarian Air Transport, TAROM, Roumanian Airlines, and TABSO, Bulgarian Civil Air Transport.



ROUTE system of East Lufthansa is designed to mesh with satellite airlines and with Aeroflot. At Prague, connections can be made for Paris, Brussels, and the U.S.

East German Fares

East German Lufthansa quotes a one-way first class fare of $268.50 from Berlin to New York. The IATA fares for the same passage are $507.80 for first-class flights and $343.40 for tourist flights. East Lufthansa's tourist fare is $180.90.

Both East Lufthansa and western airlines allow a 10% discount on round trip fares.

At the free rate of currency exchange, one Deutschemark is pegged at four to five Eastmarks, although the East German government claims that both the Eastmark and Westmark have the same value.

As a result, one dollar is worth 16 Eastmark if converted in West Germany but only 4.20 Eastmark if converted in East Germany.

Since the government-owned East German Lufthansa undoubtedly adheres to the official conversion rate, a prospective passenger could buy a one-way ticket from East Berlin to New York for 1,128 Eastmark, or approximately $70.50 at the western conversion rate. Most West German airline officials believe the East German government absorbs the resultant loss incurred.

The airline operates one daily flight between East Berlin and Moscow serving Warsaw and Vilno en route. This service is supplemented by one daily round trip flight by Aeroflot, which also schedules an additional round trip on Mondays. Wednesdays and Fridays East Lufthansa operates the Russian-

built 30-passenger Ilyushin 14 on the Moscow route. Aeroflot uses the Il-12 in addition to the Il-14 on the route.

Three flights weekly are operated by East German Lufthansa from Berlin to Budapest via Prague. Two of the flights continue to Sofia from Budapest on Mondays and Wednesdays, while the other serves the route from Budapest to Bucharest on Saturdays.

At Prague the airline makes connections with airlines of Russian satellite countries and Aeroflot to provide indirect connecting service to Iron Curtain countries. Service is also available from Prague to Paris and the Far East through Air France, to Amsterdam and the U.S. through KLM and to Brussels via Sabena.

Air India International provides connecting service at Prague for London and Rome, Cairo and Bombay. Zurich service from Prague is available through Swissair.

Passenger regulations published by East German Lufthansa do not differ materially from regulations adopted by IATA member airlines. However, rules require five days notice for flights to Moscow and beyond, and at no time are cameras or binoculars allowed during flight.

The airline operates about 12 Il-14s but plans include an expansion of this fleet to 60 aircraft by the end of the year.

Jet transports, probably the Tu-104, are scheduled for 1960.

Aeroflot Announces Fare Cuts

Moscow—Aeroflot has made the first in a series of promised reductions in its historically high domestic passenger and cargo tariff structure.

Fares on the airline's Moscow-Leningrad route have been cut from $60 to $50 and 10% round trip discounts are now being offered on domestic routes.

In Siberia, the Yakutsk-Zyryanusk fare has been cut 46%, the Yakutsk-Tiksi and Yakutsk-Verkhoyansk fares have been dropped 45%, and the passenger tariff between Tyumen and Saleckhard has been lowered by 61%. Cargo and baggage rates on these Siberian routes also have been cut.

In an effort to promote return cargo volume at points that normally generate little cargo traffic and to raise overall load factors, Aeroflot has introduced special, temporary cargo rate reductions of up to 50% for preferred customers using backhaul capacity.

Russian air service has not yet had a major impact upon the Soviet Union's overall common carrier passenger markets, according to figures released by the USSR's Central Statistical Bureau.

The figures show that airline service in 1955 accounted for 1.6% of the nation's total passenger traffic. This share of the market is the same as the 1954 level. However, the airline share for 1940 was only 0.2%; the 1950 level, 1.2%.

In 1955, Russian railroads carried 83.1% of the country's passenger traffic, buses carried 12.3% and waterways 3% of the total.

Aeroflot achieved 104.6% of its traffic goal in the first nine months of 1956. Freight traffic led by reaching 124.6% of its planned level, but passenger traffic lagged behind, achieving only 87.8% of its goal despite the introduction of Tu-104 jet transports.

Heating for Idlewild

This 1,100 ft. long trench, adjacent to the new International Arrival Building at New York International Airport, contains a part of the 38,774 ft. of underground pipe for the facility's high temperature (240F 380F) hot water heating system. The pipes lie in a bed of concrete slabs which separate the sandy soil from the heating installation.

KLM Orders Electra Simulators From Link

Link Aviation has received a contract for Lockheed Electra simulator from KLM Royal Dutch Airlines. This will be the first simulator ever made for the turboprop Electra.

Link already has contracts to build DC-8 simulators for the Douglas Aircraft Co., United Air Lines, and the Scandinavian Airlines System. It received an additional DC-8 simulator order from KLM simultaneously with the Electra simulator purchase.

The KLM contract for the Electra and DC-8 simulators totals more than $1,600,000.

A company official told AVIATION WEEK that Link hopes to receive an order for a Boeing 707 simulator shortly.

Tokyo Flight Contracts Awarded by MATS

San Francisco—Military Air Transport Service has signed contracts with three Oakland, Calif., airlines covering flights between California's Travis Air Force Base and Tokyo.

The six-month contracts guarantee movement of 350 tons a month split among the three airlines—Transocean Air Lines, Overseas National Airways and Resort Airlines.

The firms will assign three DC-4s and four C-54s to the service. The basic contract calls for movement of freight. Passengers may be carried also.

SHORTLINES

▶**Aer Lingus** carried almost 458,000 passengers last year, a gain of 73,000 over 1955. The Irish airline flew 190,000 passengers over its London-Dublin route alone, 20,000 more than 1955 traffic on the route.

▶**Bonanza Air Lines** is the first carrier to offer reduced rates for clergymen under authority granted by Congress last year. The new tariff, which becomes effective on Feb. 1, provides for half fares for ministers on a space available basis.

▶**Continental Air Lines** net profit for 1956 was $750,000, nearly double the 1955 profit of $398,564. Operating revenues totaled $18,559,000 last year, a 15% increase over the 1955 level.

▶**Cubana** has qualified five of its station managers as flight dispatchers. The five were certified by the Civil Aeronautics Administration after they

completed courses in Miami, and they will work in Cubana's new Department of Flight Dispatch and Control.

► **Flying Tiger Line** has signed a 13-month agreement with the International Assn of Machinists covering 350 mechanical employes The pact provides for an average wage increase of 16 cents an hour and includes vacation, seniority and various other provisions

► **Lake Central Airlines** began service to Erie, Pa., on Jan 1 and will begin service on its new route to Buffalo in April Lake Central also will inaugurate service to Portsmouth, Ohio, on March 1, and to Toledo and Detroit on April 1

► **North Central Airlines** flew 549,653 passengers in 1956, an increase of 28% over 1955 passenger traffic. The airline carried 37 476 lb of surface mail in the Christmas airlift

► **Ozark Air Lines'** revenues for 1956 were $5,771,000, a 34% increase over 1955 revenues. Ozark carried 321,000 passengers last year, an increase of approximately 75,000 passengers over the previous year

► **Scandinavian Airlines System** flew more than 2,270 000 lb of cargo across the North Atlantic in the year ending in September for an increase of 20% over the previous fiscal year SAS carried 280,000 lb of cargo between Los Angeles and Europe over its polar route during the same period, a 93% gain over the previous year

► **Silver City Airways** has introduced rate cuts ranging up to 30% on its cross-channel vehicle ferry services The carrier predicts that generous gas allowances for tourists on the continent will lure record numbers of British motorists across the channel this summer

► **Trans-Canada Air Lines** carried 2 1 million passengers last year, 25% more than in 1955 Over the same period, the airline's air freight traffic rose 19%, air express gained 20% and air mail traffic increased 12%

► **Trans World Airlines** began service between New York and Boston on Jan 8 with one flight a day in each direction.

► **United Air Lines** plans to hire 228 new flight officers this year, bringing flight personnel to a total strength of 3,650. The new pilots are needed to handle United's fleet expansion, which includes delivery of seven DC-6Bs and 20 DC-7s in 1957

AIRLINE OBSERVER

► **Vickers-Armstrongs probably will abandon all plans for a medium-range turbojet transport now that Trans Canada and British European Airways have decided on the turboprop Vanguard 952 (AW Jan. 7, p. 38).** The manufacturer has also dropped out of Atlantic route jet competition, and joint planning by Rolls Royce and Vickers on a long-range turbojet transport has been discontinued.

► **Catwick Airport (London) is undergoing an extensive redevelopment program. Program was begun after a tour last month of U. S. airports by an architect commissioned by the Ministry of Transportation and Civil Aviation. The newly designed airport will be reopened in mid-1958 and help relieve London Airport of all local and medium-range traffic. It also will serve as an alternate field when weather closes London Airport.**

► **British Overseas Airways Corp. inaugurated DC-7C flights last week into first-class service. Later, it will assign the fleet to tourist and tourist/first-class combination service with the Boeing Stratocruiser handling all first class traffic Pan American Airways is following the same policy on the basis that passengers prefer the two-level configuration of the Stratocruiser.**

► **New Zealand government will purchase three Viscounts for its National Airways Corp despite criticism in the New Zealand Parliament and aviation circles that the turboprop transports are not operationally suited to New Zealand domestic routes.**

► **British Overseas Airways Corp. foresees no major problems in making the transition from piston-engine aircraft to turbojets Looking back to the airline's experience with the Comet I BOAC Managing Director Basil Smallpiece said the increased tempo in flight deck operations required some minor streamlining—and, in some cases elimination—of procedures High speed of the Comet necessitated a reduction in the number of position reports to airways traffic control, but no other air traffic control privileges were sought, he said**

► **Vickers Viscount and Vanguard sales on dollar orders reached $229.5 million with the Trans-Canada Airlines purchase and George Edwards, managing director of Vickers Armstrongs, said he expects more orders to push the total to above $250 million "within the next week or so."**

► **British airline operations officials have taken the same stand as the Air Line Pilots Assn. (AW Nov. 19, p. 39) in favoring a pilot as a third crew member to replace the flight engineer on long-range turboprop and turbojet transports However BOAC plans to use a flight engineer on its Britannia operations, probably because of trade union contracts**

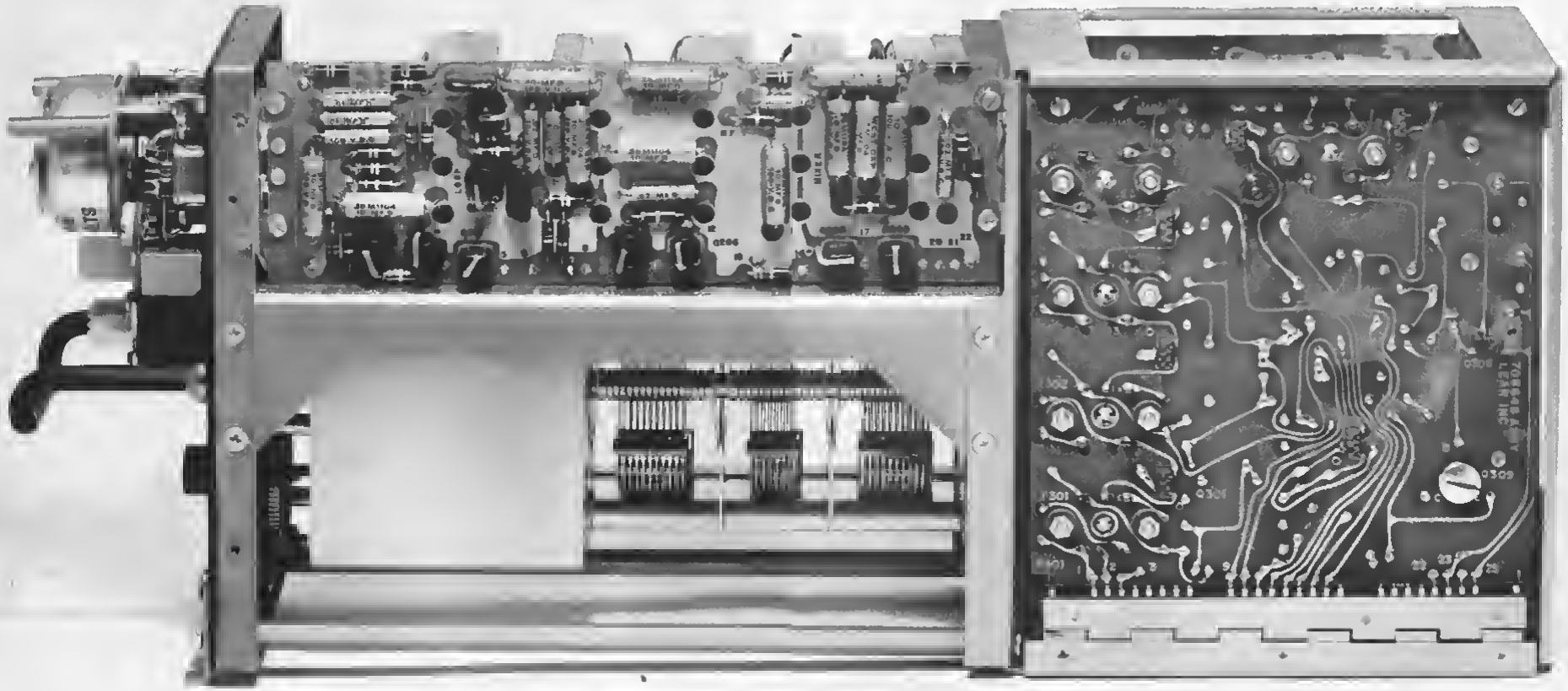
► **Ministry of Civil Aviation will soon take definite action in revising airways pattern over southern and central England in hopes of easing the congested air traffic Facilities will be modernized, air corridors will be enlarged, and a means of maintaining separation of civil and military air traffic in the area will be sought Groundwork for the projected program was laid during a meeting last month with airline operators, pilots and air traffic controllers.**

► **United and American Airlines are only U. S. carriers other than TWA and Pan American maintaining active sales offices in London. United covers European continent from its London headquarters but American has opened an office in Frankfurt for this purpose**

► **Automobile fuel restrictions in England have been lifted for tourists, according to the British Ministry of Fuel and Power. Overseas visitors purchasing a car in England, renting a car or bringing their own vehicles into England will be given sufficient ration coupons "to meet requirements of tourists in normal times." Airport limousines, taxis and buses have not been affected by the gasoline rationing**

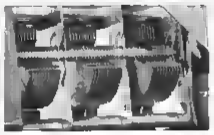
► **Trans World Airlines has suspended its international service to Chicago and Detroit until May 15 on authority granted by the Civil Aeronautics Board (AW Dec 17, p 45)**

You are now looking at the world's most advanced Automatic Direction Finder



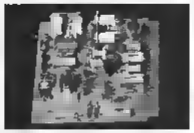
Lear builds it...the all new all-transistorized **LEAR ADF-100**

TRANSISTORS minimize ADF 100's overall size and weight, afford unprecedented dependability, reduce power consumption to 1/10 that of other ADF's, and completely eliminate warm-up time.

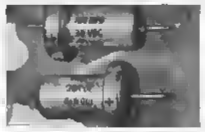


PRECISION TUNING CAPACITOR is highest quality type heretofore found only in heaviest, costliest ADF's. ADF 100 tuning system has highest calibration accuracy of any ADF.

ETCHED CIRCUITRY contributes significantly to the ADF 100's light weight, small size, low cost, and high degree of reliability. 80% of all the circuitry in the ADF 100 is etched.

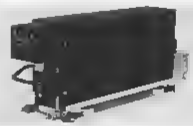


MODULAR CONSTRUCTION includes two principal back-to-back circuit boards which plug into hinge mounted connectors. Both boards are easily removable.

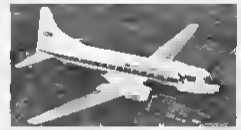


TANTALYTIC CAPACITORS, instead of conventional electrolytic units, are utilized throughout, providing greatly increased reliability through much wider temperature ranges.

PHASE-CONTROL POTENTIOMETER, easily adjustable, assures maximum loop antenna torque, providing positive loop rotation even under extreme temperature conditions.



MOST COMPACT AND LIGHTEST WEIGHT of all airline caliber ADF's, the complete ADF-100 system weighs only 18.5 lbs. The receiver unit is ⅜ ATR rack (21 x 4¾ x 8¾ inches).



CAA APPROVED FOR AIRLINE USE, of course. the ADF 100's new high levels of performance and dependability uniquely qualify it for the most demanding transport or executive plane applications.

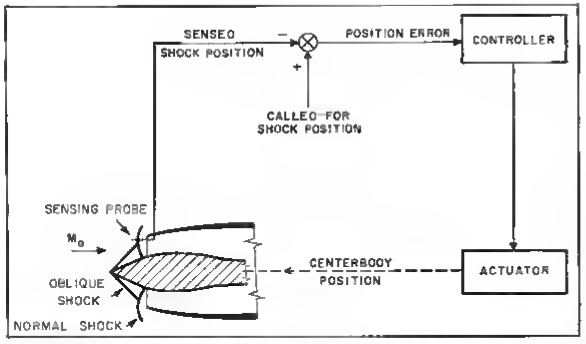


FIG 1 Inlet control's normal shock is controlled by moving the centerbody.

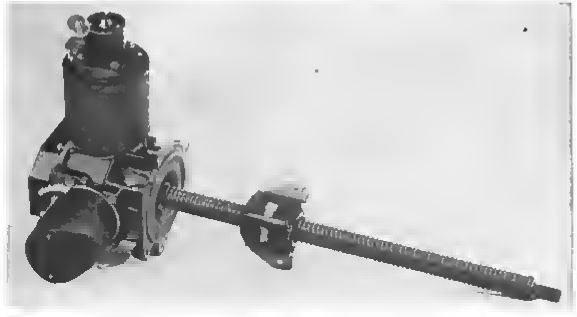


FIG. 2 The 13½ lb actuator can apply 3,600 lb to move the centerbody

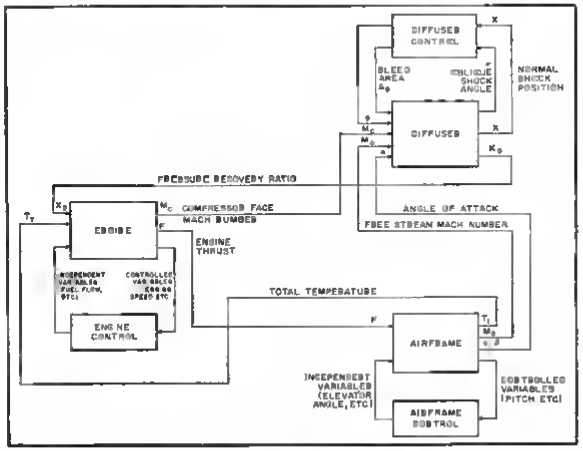


FIG. 3. The inlet control is tied in with the engine and airframe control system and becomes as important as these in supersonic flight

Principles of B-58 Inlet Control Systems Revealed

By Robert H Cushman

Design principles of an inlet control system being used on the Convair B-58 Hustler bomber were revealed recently by Minneapolis-Honeywell Regulator Co

Speaking before a Bumblebee Aerodynamics Panel at the University of Michigan last month, Ernest R Poston the assistant project engineer of the engine controls section of the company's Aeronautical Div, described the type of system which Honeywell devised to hold the shock pattern at the B-58's four engine inlets within the narrow limits permissable for supersonic flight

Inlet Center

The inlet control works by moving a spike-nosed centerbody in the middle of the circular inlet so that the shock pattern for each flight speed is where tests have shown it will best combine with the engine to produce maximum nacelle thrust

Although the best position for the shock pattern may be known, it is up to a sensing probe at the inlet to make sure that it is kept there

The importance of proper inlet shock positioning can be judged from the fact that a difference of 1 in m the position of the normal shock away from the best point can cut the thrust from the nacelle by about one third

Fig 1 shows the basic diagram of MH's inlet control A cross section of the inlet mouth is down in the left hand corner The cross-hatched area represents the centerbody and the cowl lips are above and below Coming off the foremost point of the centerbody is the first shock wave which reduces the supersonic Mach number M_0 down to a lower supersonic value Behind this shock is a normal shock which further reduces the Mach number down to subsonic, where the inlet ducting can handle it and diffuse it further from high subsonic values down to about Mach 0 4 at which the first stages of the engine's compressor can successfully handle the flow

Feedback Information

It should be noted that this is an all-external inlet configuration with internal contraction and not, as it looks to be at first sight, an internal-external compression inlet operating at subcritical condition

The probe sticking out from inside the cowl lip supplies the feedback information on location of the normal shock

MH uses four pencil sized tubes about 3 or 4 in long, spaced 90 deg apart around the inlet They have cone-shaped points and employ a number of pressure taps along their length to sense the pressure rise The pressure rise indicates whether the normal shock has passed a particular hole or not

Although a shock wave is 'paper thin' and therefore would be expected to cause a discrete on off signal from the taps, there is a gradual boundary layer build up which gives some proportional sensing effect Poston said

As the diagram indicates, the sensed position is compared to the called-for position and the difference used to actuate the controller in typical closed-loop or servo fashion

Ideally the called for position should be computed by an "optimalizing" system which continually seeks to place the centerbody at the position which gives maximum nacelle thrust It could do this for example, by sensing the nacelle thrust output by means of a strain gage located in the supporting strut and by continually "slow frequency dithering" the centerbody about that position which gave maximum strain gage reading from the strut Unfortunately this refinement has not been reduced to practice and at present the system is forced to rely upon stored information from wind tunnel and specially instrumented flight tests as to the best position for the shock wave for any particular flight conditions

The called for shock position may be fed in by cranking the probe in or out (through a range of 3 in for this 30 in diameter inlet) to locate its central pick-up hole where the shock is desired, or for less drastic variations (say up to ¾ in) by internally biasing the error signal in the controller's amplifier

Though the controller was not described, a picture of the actuator which Honeywell now has 'on-the shelf' for this purpose is shown in Fig 2 It consists of a 115/200 volt 3-phase 400 cps electric motor with an electric brake of the power release type The reduction gear train has a detent clutch to relieve shock loads and a ball-bearing jack screw with a traveling nut to produce the spike motion It has a 13 4 in travel and will drive a load of 3,600 lb at 0.165 in per second

The centerbody which experiences a forward thrust caused by the increasing pressure gradient on its downstream side needs the 3,600 lb actuating force The forces needed to actuate ramps on cheek inlets may be even greater, Poston said

As Used on B-58

The B-58 takes off and accelerates into transonic speeds with the centerbody spike retracted back to permit the inlet to scoop as much air as possible But as the pilot gives his plane the throttle and puts the engine on afterburning, the fight between engine thrust and airplane drag starts, and the variable supersonic inlet mechanism has to be brought into play

The spike is needed at about Mach 1 5 when the relative flow speed is enough to cause the shock wave from the tip to bend back obliquely and form with the normal terminal shock which follows, a shock system which both gulps in more flow than would be possible with a simple subsonic inlet and aids the engine compressor in packing dense slow moving air into the engine combustor

Centerbody Travel

However, in practice the control system may not be of much use until Mach 1-7 to 1 8 is reached as the shock strength is too weak for the pick up at Mach 1 5 As the plane continues up to full speed of Mach 2 5, the total centerbody travel may be in the order of 5 in, but again the important thing to remember is that without this variation a plane, even one which has a perfect configuration for Mach 2 5 flight, could not get up through its off design points to its design speed, Poston said

That the complete system can be much more complicated than the simple single loop diagram of Fig 1 is shown by the many interacting loops of the inlet-engine-airframe combination

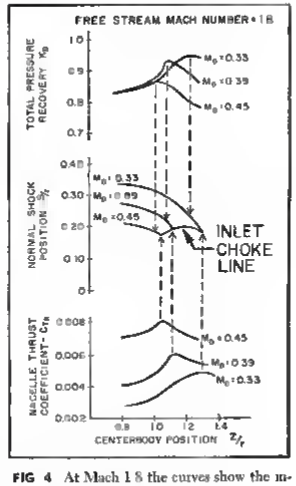


FIG 4 At Mach 1 8 the curves show the inlet discussed has a very pronounced effect on the powerplant pod's output

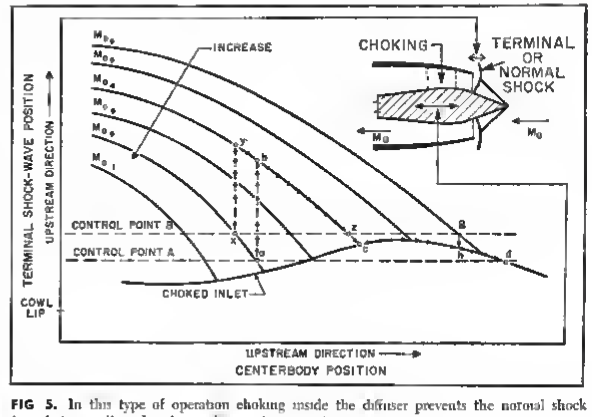


FIG 5. In this type of operation choking inside the diffuser prevents the normal shock from being swallowed and complicates the control action

Valve Talk

FOR WM. R. WHITTAKER CO., LTD.
BY MARVIN MILES

How would you like a plug-in valve that can be removed and replaced in an undrained system with the loss of no more than half a cupful of fuel or oil?

Sounds impossible, I know, especially when you consider that such units are installed in tanks or line-mounted, but it's true nevertheless. Whittaker can deliver them in line sizes of one to three inches.

The southern California valve company first came up with plug-in units early last year, permitting the entire valve mechanism — including actuating motor and reduction gear train — to be installed or removed as a single package.

Now the design (originally achieved for the Douglas C-133 turboprop transport) has been refined to the point where fuel or oil loss is negligible, no matter if the valve is in the bottom of a wing tank and the adjacent lines or tank are full.

Compare this with the work, the time loss and the fire hazard in replacing a conventional valve: the draining and inerting of the system while a fire crew stands by, the removal of structural sections, the perversity of the units in resisting replacement . . .

The secret of Whittaker's new plug-in valve is a secondary seal incorporated in the unit, a seal that is used only when the valve is removed and replaced. A partial turn on removal does the trick, sliding a seal into place in the housing. Then, when the substitute valve is installed, a reverse turn releases the seal and clears the line. As simple as that.

Of course it wasn't simple in design. It took a lot of engineering to assure smooth, simplified operation and full, definite locking and opening of the seal with integral provisions which preclude any possibility of improper installation. But the results are multifold.

For one thing, the seal-equipped plug-in valve will cut maintenance (unit replacement) time by an estimated 95 percent when incorporated with a cover plate for ready access.

No longer will it be necessary to haul the airplane to an isolated area and guard it with fire crews while the system is drained of volatile fuels. No longer will it be necessary to wrestle with structure sections such as leading edges in order to get at the assembly. No longer will it be necessary to tug and haul at the assembly itself.

Simply disengage a lockscrew, disconnect the electrical plug, turn the unit a short way to lock the seal and remove the valve element. For quick replacement install in reverse order. No strain, no danger — and everything accomplished on the flight line if need be.

What about additional weight? Practically none, such a small percentage of the over-all unit weight that comparison with a conventional non-replaceable plug valve is remarkable.

As for type of actuation, Whittaker engineers tell me the plug-in valve can be operated by a direct trunk arrangement, by pulleys, by either AC or DC electrical actuators or by a Whittaker-designed override mechanism that allows cable or manual operation with over-travel in systems where sequencing is necessary, i.e., a fire shut-off valve system wherein one valve at a time is operated as the control lever is moved through its travel.

Phil Terry, Whittaker field engineer, has this to say of the new unit's design features:

The plug-in type valve can be provided with integral thermals in one or both directions for any type of fluid or low temperature air and can be designed for either tank bulkhead or line mounting.

"The body in which the valve mechanism is installed provides a definite protection to the valve mechanism itself and is less prone to leakage than other types of valves because once the plumbing is connected it need never be removed from the body of the plug-in valve for the life of the airplane except for replacement of port face O-rings or gaskets in accordance with age requirements."

Basically the plug-in valve is designed to increase utilization. Ground delay is costly, in combat or in airline operation, and its causes are far too numerous. Whittaker has eliminated fuel valve replacement delay — a long step in the right direction — and similar achievements are upcoming mandatory equipment when the cost of a grounded airplane is summed up.

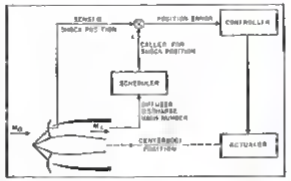


FIG. 6 Scheduler added to the basic inlet control "tailors" the called-for shock position to suit the downstream Mach number.

shown in the block diagram in Fig. 3. Poston stressed that the inlet designer must be able to get enough of the characteristics of each of these "black boxes" so that he can simulate the control dynamics by wiring up and adjusting an analog computer.

Example at Mach 1.8

Hon one circular nose inlet studied by the Aeronautical Dn. behaved at Mach 1.8 is shown in Fig. 4. Total pressure recovery, normal shock position, expressed as ratio of shock distance from lip over lip radius, and nacelle thrust coefficient are plotted against centerbody position, expressed as ratio of the distance from the cowl lip to the front end of the centerbody spike over the lip radius.

The curves for three different downstream diffuser Mach numbers are shown in each graph. These different Mach numbers might be due to variations in ambient temperature or to changes in the engine's compressor speed. Note that as the spike is moved forward, the pressure recovery curves peak in each case (top graph) and then, just about where the choke line intersects the bottoms of the three shock position curves, (center graph) the maximum nacelle thrust is achieved (bottom graph).

The fact that the maximum nacelle thrust is not necessarily achieved at the same operating point where the maximum pressure recovery is achieved, is important to the inlet designer. He must have a clear picture of what the aircraft designer is trying to accomplish in performance if he is to choose the proper goal for his control system.

Fig. 5 shows an elaborated version of the middle graph of Fig. 4.

Poston used this graph to illustrate the possibility of control ambiguity with present shock positioning devices if the inlet is either an all external compression type with internal contraction or falls into this mode of operation when operating below its design flight Mach number.

At first sight the shock pattern shown in these illustrations, which has the second normal shock expelled out in front of the lip, would appear to be of

KC-135 Production

Boeing KC-135 jet tankers are shown in final assembly in the company's Renton, Wash. plant. An undisclosed number of KC-135s are being built for the Air Force. From a parallel assembly line in the same plant will come 707 jet transports for commercial airlines.

the undesirable subcritical type. The subcritical inlet operation is avoided because, not only is it inefficient, but the second normal shock is prone to "buzz" or oscillate as it is alternately swallowed back into the inlet, then regurgitated again.

Internal Flow Shape

However, this particular inlet has an internal flow shape and is working at a speed which would cause it to choke internally before it allowed the normal shock to be swallowed. Therefore, it is not the same as an internal-external shock system inlet which would preferably be operated with the normal shock held back just inside the lip.

The confusion arises from the conventional description of critical inlet operation as having the normal shock just at or inside the lip, and all operation with the normal shock outside the lip labeled subcritical. Actually, in the most general sense, the definition of critical operation is that point in going from supercritical operation to subcritical just before the mass flow begins to fall off, according to Fred Moynihan, Sr., engineer at Rosemount Aeronautical Laboratories, University of Minnesota. Moynihan has been part of the university program to aid MH with wind tunnel support.

In Fig. 5 the critical, or most desirable, operating point for this inlet is just above the choked inlet line because, as shown in Fig. 4, here the nacelle thrust and less important, the pressure recovery, is maximum. But said Pos-

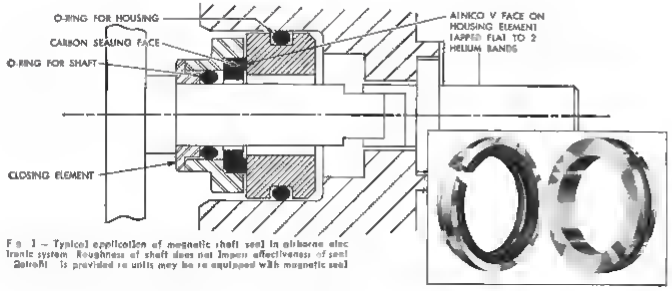


Fig. 1 – Typical application of magnetic shaft seal in silicone electronic system. Roughness of shaft does not impair effectiveness of seal. Retroft is provided so units may be re equipped with magnetic seal

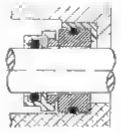


Fig. 3 – LOW PRESSURE MAGNETIC SEAL

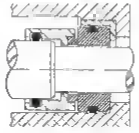


Fig. 4 – HIGH PRESSURE MAGNETIC SEAL

Shaft Sealing Problem in Airborne Electronic Gear Solved Through Magnetics

Effective, new magnetic shaft seal holds silicone lubricant in system under severe operating conditions.

By: Edward A. Steeves
Member, ASME

Some fluids are considerably harder to seal than the usual lubricants, coolants and fuels found in aircraft systems. Among these are many of the silicones encountered in military applications.

Occasionally these hard-to-seal fluids must be sealed under adverse operating conditions such as loose or rough finished shafts and housings.

In addition, the customary factors of space and weight must be given full consideration.

By applying magnetics to this problem, designers have come up with an effective solution. The magnetic shaft seal *(Fig 2)* provides an effective seal from the time it is installed requiring no "wear-in" period to seat the seal. It conserves space because springs and screw-tightened packing are replaced by magnetic attraction between the shaft element and housing element of the seal. Force is distributed evenly throughout the metal, so wear is slow and even, and the seal performs reliably for much longer periods than spring-loaded and packed seals.

Operating Principle

A magnetized ring of Alnico V, with an O-ring gasket on its outer surface, is inserted in the housing. Another ring is mounted on the shaft and held firmly against the Alnico element by magnetic force. A carbon ring in the face of the shaft element contacts the lapped surface of the magnet and forms a permanent, self-adjusting face seal.

An O-ring mounted inside the shaft element prevents the confined fluid or gas from escaping along the shaft. The O-ring on the magnetic element keeps the fluid from leaking out of the housing.

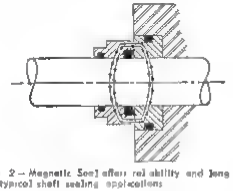


Fig. 2 – Magnetic Seal offers reliability and long life in typical shaft sealing applications

Advantages of Magnetic Shaft Seals

Reliable, effective sealing is characteristic of the magnetic shaft seal. One of the elements of the seal is permanent magnet, so the sealing force is "built-in". No springs or screws are required; the sealing force is evenly distributed over the faces of the seal. There's no face leakage initially, and the seal "wears in" over its entire life — in many cases longer than the life of the shaft.

It is more compact in design and lighter in weight than any conventional seal.

The carbon sealing face is self-lubricating — runs cool and wears slowly.

Typical Application of Magnetic Shaft Seal

Magnetic Seal Corp. developed for Raytheon Manufacturing Co. a special shaft seal for airborne electronic equipment which involved the problem of a rough shaft with a sharp shoulder and a silicone lubricant that had passed every other type of seal tested. One of the special conditions involved applying the seal to units that were already in operation with unsatisfactory spring loaded seals.

The magnetic seal solved the problem.

The unit consists of a flanged retainer ring that is slipped over the shoulder and onto the shaft. This retainer is followed by an O-ring gasket which slips over the sharp shoulder without damage, and bears against the retainer ring. The shaft element with carbon sealing face is assembled onto the shaft. An Alnico V permanent magnet housing element with optically flat face completes the seal and provides the force to hold the shaft sealing element and housing sealing element together.

The complete unit functions effectively in keeping the silicone lubricant confined while preventing the entrance of contaminants.

Production quantities of these seals were delivered on a rush schedule. In addition, fast delivery was made on seals to replace inadequate units already in operation in the field.

Specification for Shaft Seal in Fig. 1

	Outside	Inside
Fluid or Gas		Monsanto 0545
Pressure (max.)		25 psi
Temperature F (max.)		– 55° to 280°
Shaft Distance (in.)	¼	
Material	Steel	

Standard Magnetic Seals Available

Standard magnetic shaft seals are available to seal liquids or gases at high or low pressure differentials across the seal. Shaft diameters up to 2½" can be accommodated by low pressure model #10 *(Fig 3)* and high pressure model #20 *(Fig 4)*. There is also a standard model, #30, for shafts over 2½" dia.

Additional Technical Information is Available

Send for complete brochure on magnetic shaft seals.

Additional S-56 Power

Sikorsky Aircraft is currently considering installing a T58 gas turbine to provide supplemental shaft power to its S-56, powered by two R 2800s. The gas turbine could be mounted on the top of the fuselage directly ahead of the main rotor and transmit its power directly to the main rotor transmission. The T58 would give the S-56 increased vertical performance for much longer periods of time than tip-mounted rocket engines.

ton, the fault with an inlet operating like this is that the control may not know in which of two places it is located. Because of the hump in the choked inlet line there is the possibility of having two operating points, both of which satisfy the control, but only one with acceptable efficiency.

This ambiguity increases as the control line is lowered for more inlet efficiency.

How this happens can be understood by examining some sequences of control. For these examples it will be understood that the plane is flying along at steady Mach 1.8 but for some reason the downstream Mach number M_{ts} changes. The control point is set by positioning the probe at the front where it is desired to hold the shock wave.

Disturbance Rectified

If the discharge Mach number (M_{ts}) downstream of the inlet diffuser stays constant while the probe is set to maintain the shock at "a", any disturbance of the shock position will be rectified by a correcting movement of the spike.

The system will act as a simple servo and be stable. However, if for some reason (sudden change of temperature or compressor speed) the downstream Mach number changes, the graph indicates that there is a definite possibility for the control system to make a poor choice.

For example, if the downstream Mach number decreases from (M_{ts}) to (M_{tw}), and causes the normal shock wave to shift upstream from "a" to "b", then the control action will take place along (M_{tw}). The control system knows nothing about the change in the downstream Mach number. All it knows is that its probe tells it that the shock wave is out of place. Therefore, it tries to move the centerbody out to pull the shock wave back down to the operating line. But when it gets to "c" the choking of the inlet's internal ducting prevents the shock from being pulled further back, so the action carries on along the choked line to "d" where the shock satisfies the control because it is at the operating line.

Not Best Performance

While condition "d" may satisfy the control system it will not satisfy the criteria of best possible performance because, as Fig. 4 shows, the lower discharge Mach number at "d" corresponds to considerably less nacelle thrust than would have been obtained at "a".

One way of eliminating this sort of mistake is to raise the control line to B and keep the called-for shock position out ahead of the choke line. For line B the shock position would have gone from "x" to "y" upon the change of diffuser Mach number, then down only as far as "z", without the drop off in nacelle thrust. Unfortunately this "fix" would prevent the system from realizing the best settings for highest nacelle thrust values down in the lower left hand part of the graph where the choke line dips down.

A refinement to overcome this last objection suggested at MIT, said Poston, is to bias the shock control point according to the diffuser discharge Mach number. The scheduler added in Fig. 6, has been added to accomplish this. This scheduler would call for

a control line suited to each diffuser discharge Mach number so that each would be held close to their choke line

But this too could result in confusion if for example, the diffuser discharge Mach number rapidly rose from (M_{2a}) to (M_{2g})

The inlet shock would go toward curve (M_{2h}) but stop with choking at "h" Meanwhile the control line has been biased down from line **B** to **A** which agrees with the (M_{2g}) signal to the scheduler

The spike control will try to satisfy the demands of the lower control line and drive the spike out so that the spike-shock relation ends up by sliding down the choke line to "d' Again "d" has a poor nacelle thrust compared to the desired point "a". As a final fix, it was suggested that the bias mechanism be made to work so slugglishly that the operation had a chance to move over to the left, and get over the choke line hump, before lowering the operating line to A

This represents the first half of an 18 month, quarter-million dollar Phase I study contract from Wright Air Development Command. It is the first such contract awarded to private industry, according to Minneapolis-Honeywell, and M-H expects Phase I will be followed by Phase II and III, which have yet to be awarded, and will extend the program another five years or more

Navy Awards Contract For R7V Maintenance

Ontario, Calif.—New contract for the heavy maintenance of 37 R7V-1 Navy transport aircraft has been awarded Lockheed Aircraft Service, Inc.

The contract calls for the cycle recondition of the aircraft after each 1,400 hr. of flight

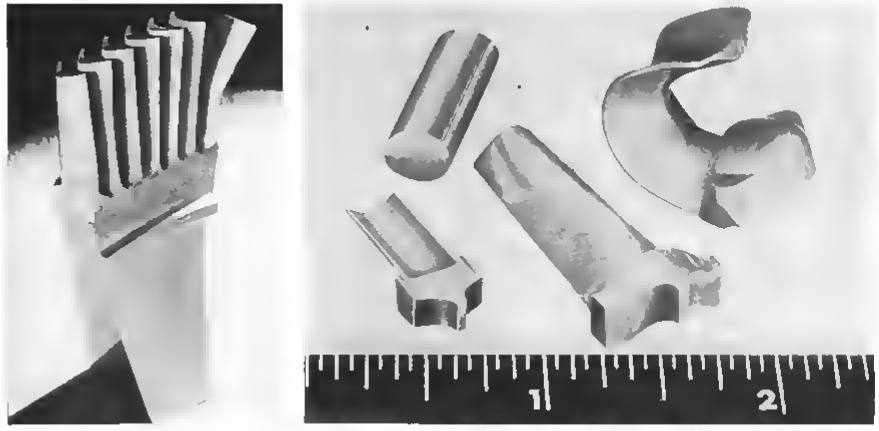
Work will be performed at Lockheed Aircraft Service's base at International Airport, Ontario.

The R7V-1 is a Navy version of the commercial Super Constellation constructed to permit the transport of either cargo or passengers in varying combinations.

Long-Range Britannia 312 Makes Its Initial Flight

London—First of the long-range Bristol Britannia 310s has made its initial test flight from the airfield at Filton.

After completing trials for its Certificate of Airworthiness, the first aircraft will be delivered to BOAC for operation on the North Atlantic route late this year.



SECTION of turbine wheel (left) shows blades cold forged. Blade on far right was bent to demonstrate resistance to fracture. A blade was bent before hardening (upper right) more than 90 degrees without developing cracks or tears. Turbine blades are produced from slugs like that at top

Company Achieves Cold Forging of Turbine Blades, Other Components

Cold forging of engine turbine blades and other super-alloy components has been achieved by Impact Products, Inc.

The new blades have outlasted similar precision cast blades in a ratio of six to one in accelerated fatigue tests.

Through controlled reductions and annealing during manufacture, the blades made by Impact Products, Orangeville, Ohio, have an average grain of ASTM No 7. Surface is held to a high luster matte finish, depending upon the polish put into the forging dies.

Previously, larger blades were hot forged and polished to tolerance and smaller sizes vital to the guided missile program were investment cast.

No Imperfections

The company says there is no surface scale or imperfections to be polished off cold forged blades in additional operations. This high finish can be important in reducing frictional loss, and also increases useful life of the blades through the absence of stress raisers left by minute grinding lines.

The possibility of internal porosity has been reduced through use of cold rolled slugs for the blade blanks which are inspected and tested prior to use. Seams and laminations can be detected and defective slugs discarded.

Tolerances that are obtained in cold forging bear no relationship to hot forging practice but are equal to, if not better than, the best of investment castings.

Tolerances

The blades have tolerance demands of plus or minus .002 on all airfoil surfaces. On lot sizes for an individual application, closer tolerances can be held. Balancing problems are simplified due to the ability to hold finished blades to close tolerances and greatly increased production speeds.

The metal is extremely sound and distribution of internal flow patterns is excellent, according to H. E. Chatfield, vice president for research and development.

A finished S-816 blade, for example, can be bent backward (before hardening) more than 90 degrees without developing cracks or tears. This can be done on blades with an edge thickness of .020-inch.

To illustrate the inherent soundness of the process, Chatfield said, Impact Products has developed shrouds at the turbine blades' tail sections by upsetting and trimming the metal to the shape and dimensions desired. All edge airfoil sections throughout the blade are radiused to conform with print dimensions without resorting to grinding.

Turbine blades are being manufactured from ¾ in. to 1½ in. in length with abrupt section changes and with edge sections as thin as .015 in. The blades have outlasted similar precision cast blades in a ratio of six to one when subjected to accelerated fatigue test conditions.

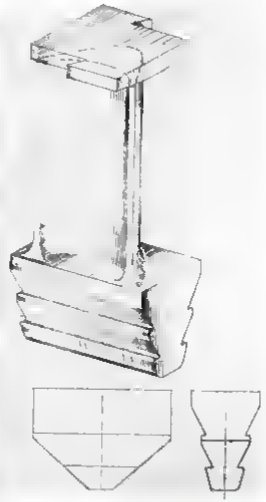
Impact Products developed the technique for precision cold forging of super alloys after developing closed die precision cold forging practices on aluminum and steel. During this early work, Impact Products devised a method to manufacture forgings that previously were duplicated on screw and milling machines or grinding operations.

Previous Experience

The experience gained on aluminum and steel cold forgings enabled Impact Products to evolve a process to forge and trim super alloy slugs into the contours necessary in contemporary turbine blades and other intricate patterns.

The company also developed special die retainers and presses. Combining this equipment with the new techniques, Impact Products has been able to use standard tool steels as well as carbides while extending die life, even though the unit pressure sometimes approaches the compression strength of the steel or carbide die.

The company says precision cold



DRAWING shows development of shrouds at tail sections of turbine blades. The metal is upset in cold forging and trimmed to shape and dimension desired

forged parts have more uniform tolerances, improved finishes and excellent fiber flow. The material is substantially stronger and distortion or warping that results from heat treating is eliminated.

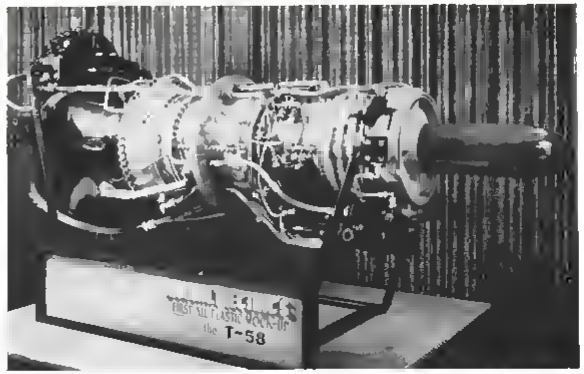
Stack up cannot occur in cold forged parts because they are formed within the confines of a die. Cost reductions are not an important factor in the process, but modest economies have been realized in a few instances.

Impact Products is a successor of Applied Research Corporation which had been engaged in a two-year joint research and development program with Townsend Company of New Brighton, Pa., on fabrication of high alloys. Townsend recently acquired controlling interest in IPI.

Impact Products has cold forged various metals such as A-286, S-816, Molybdenum, Inconel 700 and 713 and Unitmet 500. Chatfield said:

"With few exceptions, there is no doubt that present super alloys can be cold forged to desired shapes and tolerances. Any geometry of shape common to hot forge or investment casting practices can be obtained in this cold forge process."

At Impact Products, a variety of parts has been precision cold forged with consistent success. These include diaphragm plates, instrument cams, sewing machine parts, wire wheel hubs for velocipedes, spherical seats and seal assemblies.



GENERAL ELECTRIC SAYS its full-sized plastic installation model of the T58 turboshaft engine is extremely accurate in every detail to permit its use in positioning and connecting in airframes. The model is made of fiber glass reinforced epoxy resins and was built with new fabricating techniques developed by Atkins & Merrill, Inc., of South Sudbury, Mass.

Plastic Mockups of Engines, Components Produced Cheaply

Full-scale installation mockups of engines and smaller components are being made of molded fiber glass reinforced epoxy resin plastics. They can be reproduced in quantity cheaply and are dimensionally stable and durable. The models manufactured by Atkins & Merrill, industrial scale model builders, are used to check airframe clearances and installation connections.

Mockups have been made of the General Electric T58 turboshaft for the Vertol H-21 and Sikorsky S-58 helicopters, the General Electric J79 turbojet for the Grumman F-11F, Lockheed F-104, Convair B-58, and a classified Pratt & Whitney engine. Various accessory and control mockups have been made for Hamilton Standard and Bendix.

Plastic Cheaper

The manufacturer claims that the laminated mockup is about 15% cheaper than metal. Metal mockups are supposed to be made of scrap parts but good ones must often be used because of a shortage of rejects. The laminated mockup is said to be about 40% cheaper than a wooden one with the same perfect detail. Cost of the molded T57 mockup has been set at $9,000.

Because of their high price and vulnerability to damage, detail is usually sacrificed in wooden mockups. Atkins & Merrill engineers believe the laminated plastic will prove to be more durable than metal.

The female mold is made by casting a flexible vinyl material between a master model and a rough-shaped rigid outer shell. The lamination does not shrink after molding so the master model can be built exactly to scale without trying to predict shrinkage factor for complex undercut shapes.

Good Detail

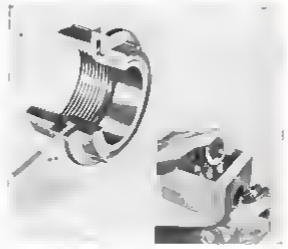
The epoxy resin plastic is laid into the mold with a paint brush. The first layer is a gel coat formulated to pick up detail. It is ⅛ to ¼ in. thick. Where undercuts or depressions are too deep or too steep to be reached by broad fiber glass sheet, cut fiber glass strands and epoxy plastic are mixed into a furry paste and used to build up a simpler shape. Fiber glass sheets are tightly or loosely woven depending on the degree of flexibility needed.

The metal mounting and connecting parts are inserted into the model during lamination. The model, air cured, is finished in about a week. It can be removed from the mold after setting over night.

Time from the start of work on the master model to the completion of the first molded mock up is about six or eight weeks. Each succeeding reproduction takes about four weeks. Because much of the curing is done out of the mold, production of successive mockups overlaps.

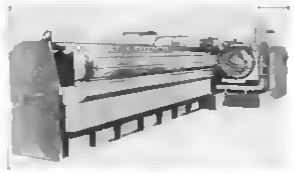
PRODUCTION BRIEFING

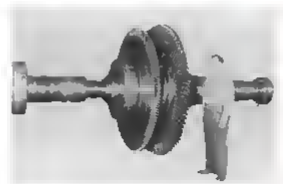
Myers Electrical Products, Inc., Montebello, Calif., claims that its "Screw-Tite" hub will make air and water tight conduit joints for electrical (or other) conduits going through bulk-



heads in aircraft. When the nut is tightened up on the hub they close up upon the bulkhead and compress the O-ring contained in a groove in the hub.

Large horizontal broaching machine made by Lapointe Machine Tool Co., Hudson, Mass., is shown cutting the "pine tree" slots to hold the turbine





blades on a 16,500 KW heavy duty gas turbine. The 240 in. stroke machine with two passes per slot, is able to remove 150 lbs. of metal from the 90 slots at 2½ hours per wheel.

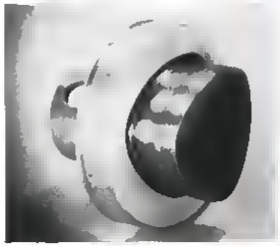
The Dayton Rubber Co., Dayton, Ohio, says that it is now able to formulate a foamed-in-place plastic in which the foaming is slowed to 100 to 180 seconds as compared to the former quick reaction of 30 to 60 seconds. This gives the workmen an adequate interval after mixing to pour the molds. Dayton says that its two-component liquid system of polyesters

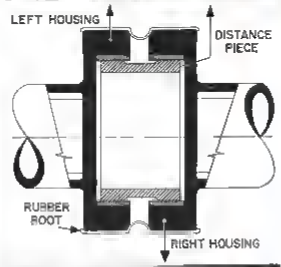
and isocyanates has already been approved by several manufacturers.

Norton Co., Worcester 6, Mass., announces that it will pay up to $2.00 per carat for diamonds reclaimed from grinding swarf and diamond wheel stubs returned by customers. Thus, they say, is an increase of 10%.

Sintercast Corp., Yonkers, N. Y., announces that due to its new process, "Sinterwrought," it is now possible to produce wrought materials with a homogeneous structure even though the original ingredients of the powder mixture are partially or totally insoluble in each other. The company reports that a special aluminum foil strip has been produced which contains a uniform and accurate distribution of a small amount of an element needed in atomic energy reactors. While it has the density, elongation and mechanical strength of conventional rolled aluminum foil, it contains the precise amounts of additives needed for nuclear purposes.

The three main parts of the Kerns



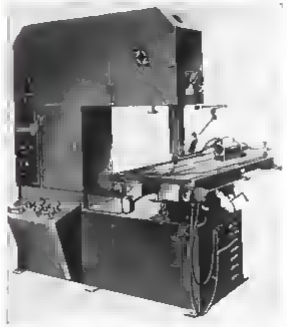


Manufacturing Co., Long Island City, N. Y.'s Tri-Lobe coupling are shown in these two photographs and cutaway drawing. The coupling, which was described on page 59 of the Dec. 24 issue, is being used to replace involute spline couplings on General Electric's T58 turboshaft engine. Kerns believes that it can also be used to replace other types of flexible couplings.

Consolidated Electrodynamics Corp., Pasadena, Calif., says that it is importing a laboratory arc-melting vacuum furnace which will simulate conditions in a large production furnace from W. C. Heraeus GmbH, Hanau, West Germany. Using either consumable or non-consumable electrodes, the furnace produces melts which range in size from buttons of a few ounces to ingots of several pounds.

Mallory-Sharon Titanium Corp., Niles, Ohio, plans to start reclaiming Titanium scrap as soon as its pilot plant for electrolytically refining pro-

duction left-overs is completed. If successful, Mallory-Sharon says it will use the new process to produce high-quality titanium out of scrap. In the Dean-Raney process which Mallory-Sharon will use, large crystals of extremely pure metal are formed on a steel cathode in a heated electrolytic solution.

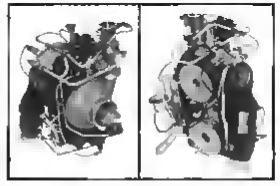


S & S Machinery Co., Brooklyn, N. Y., states that its Midsaw "tridraulic" bandsawing and filing machine has the flexibility to handle a range of materials from stainless steel to corrugated paper. Employing blade speeds from 45-10,000 fpm, the saw comes in throat widepths of 36 and 48 in.

Clamping fixture for spot welding a missile skin to corrugated reinforcement is made of epoxy laminations over a steel substructure. Furane Plastics, Los Angeles 39, Calif., whose Epocast brand resin was used, says

Lockheed C-130A Hercules uses Stratos 2-Pad Bleed Air Turbine as generator, hydraulic drive

A single constant speed air turbine drive does double duty aboard Lockheed's C-130A Hercules logistics carrier. The 45 hp unit, built by Stratos, operates on air bleed from the engine compressors and drives both a 400 amp generator



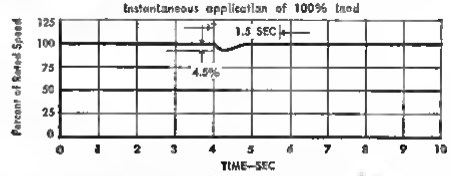
MODEL TP25-2A
Constant Speed 2-Pad Air-Turbine Drive

and a hydraulic pump. Nominal output at the 6,000 rpm generator pad is 25 hp while the nominal rating at the 3,500 rpm hydraulic pump pad is 18 hp. Fully qualified, the unit, Stratos Model TP25-2A, automatically maintains constant output speed regardless of input conditions or load. The integral overspeed protection has been proved reliable. Compact and light, the unit can be used in many applications where two sources of mechanical power are required.

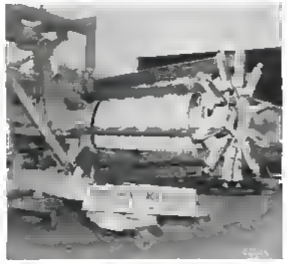
Shaft speeds other than the 6,000 and 3,500 rpm ratings of the -2A model can be provided. Likewise, the available horsepower can be divided in other proportions to meet other requirements. Since such variations would require only a minimum amount of changes in gearing, units to meet specific requirements can be developed quickly.

While the model TP25-2A — newest of Stratos' line of constant speed turbine drives — is used to drive a DC generator in the C-130A application, speed control accuracy makes it suitable for use with alternators. As in other models, the fast-acting governor holds output speeds within ¼ of 1% from no load to overload conditions at all altitudes. The units are extremely rugged — models of the TP25 series have been whirl tested at 9Gs under full load to simulate aerobatics. Even under such conditions, speed variation was only 1.9 per cent.

Speed Control Characteristics of the TP25-2A during typical transient condition



For details on these and other Stratos auxiliary power turbines write to:
***STRATOS** — Bay Shore, Long Island, N. Y.*
A Division of Fairchild Engine and Airplane Corporation

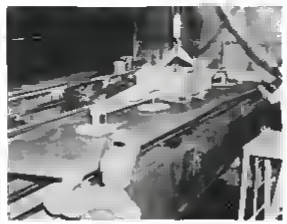


that the "leading airframe co." who had this fixture made was able to save 40% in time and approximately 70% in money, compared to a comparable all-metal tool.

Waltz Furnace Co., Cincinnati, Ohio, has designed this new furnace to heat treat 17-7PH stainless steel (and other materials) aircraft wing sections

up to 74 by 100 in. It has two cast iron dies inside the furnace to flatten while tempering or precipitation hardening the skins. The furnace is of the circulating type and the temperature can be held within 5 degrees of any value between 250 to 1,100F.

Vac-U-Lift Co., Salem, Ill., claims that its sheet metal lifting system called



Vac-U-Lift will handle sheets, tanks, etc. up to 16,000 lb. Vacuum is supplied by a rotary pump.

Long-Nosed B-57 Aids Bomarc Tests

Concurrently with trials of Boeing Bomarc missile at Patrick AFB, Fla., Boeing's Pilotless Aircraft Division will use this specially modified Martin B-57B jet bomber to flight test components for the missile's guidance system (also see AW Dec. 24, 1956, p. 37). System can be tied into the airplane so that it will home on targets flying at high altitudes to test component efficiency.

Ceramic Coating of Molybdenum Offers High Temperature Uses

Hot forging ceramic coatings onto molybdenum powder pre-form slugs may provide a new means of achieving turbine materials for very high performance turbojets.

Elraco Engineering Co., Hoboken, N. J., reports that its "hot-coining" process produces a protective coating for molybdenum which has sufficient ductility to operate successfully in a gas turbine.

However, the process has yet to be tried on a gas turbine.

Developed in cooperation with the Powder Metallurgical Laboratory of Stevens Institute, Hoboken, the Elraco process has been considered by the Navy Bureau of Ships for use in Solar Aircraft shipboard gas turbine auxiliary powerplants.

Here the main need is for resistance to oil-ash corrosion on combustion and turbine parts (not necessarily molybdenum).

These shipboard turbines must be able to stand up against the severe corrosive effects of the crude boiler fuels they must use if they are to be economical.

Process Details

The Elraco process consists of dipping the pressed powder pre-form into a liquid ceramic solution and heating it to 2350F. Then, still at that temperature, the coated part is hot coined or swaged so that while the parent metal is being forged into a unity, the ceramic coating is being driven down between the surface grains.

Advantage claimed for this forced diffusion of the ceramic coating into the parent metal is the surer bond between the ceramic and the metal. Final "uncoined" ceramic coating is baked on afterwards to insure that any discontinuity in the forged layers underneath is bridged.

Elraco Process

Because the Elraco process has not been carried much beyond the lab oratory stage, Stevens feels strongly that it should be submitted to extensive development and testing, and especially should be evaluated for resistance to thermal shock. Elraco thermal shock tests, which have consisted of relatively crude plunges of samples out of the oven into ice water baths, should be supplemented by many cycles between gas flames and air streams, Stevens believes.

Another question is how difficult it will be to manufacture complicated shapes of nozzle guide vanes and turbine blades. Considerable know how will have to be acquired so that the coining dies will not build up the

Aircraft and Equipment Backlog

The value of backlog of orders of complete aircraft, aircraft engines and aircraft propellers for the third quarter of 1958 amounted to $19,363 million according to the U. S. Department of Commerce. This is an increase of 7% over the backlog of June 30. The U. S. military represents 77% of the total backlog aircraft orders, 83% of the aircraft engine orders and 72% of the aircraft propeller backlog.

Net new orders received during the quarter represent 19% of the backlog at the end of the quarter.

PRODUCT	Backlog June 30, 1958	Net New Orders During Quarter	Net Sales During Quarter	Backlog September 30, 1958
TOTAL	17,192	3,493	2,322	18,363
Complete Aircraft and Parts	11,288	2,408	1,406	12,250
For United States Military Customers	9,524	2,127	1,197	9,454
Other	2,724	281	209	2,796
Aircraft Engines and Parts	3,885	509	459	3,935
For United States Military Customers	3,231	409	388	3,255
Other	654	101	75	680
Aircraft Propellers and Parts	152	34	29	157
For United States Military Customers	110	24	21	113
Other	42	10	8	44
Other Products and Services	1,907	542	428	2,021

ceramic coating on some areas while starving others

Steps in Process

The steps in the Elraco process are

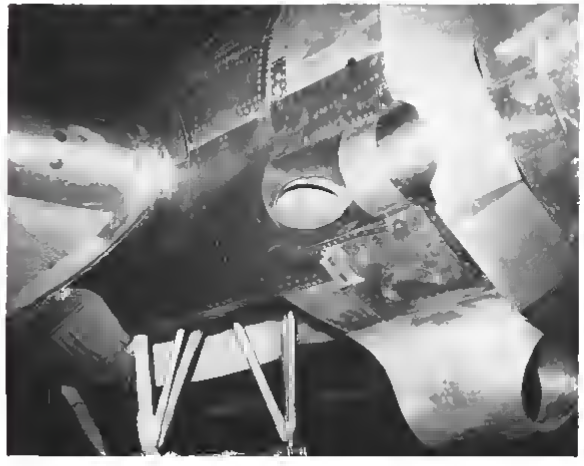
• Powdered metal is pressed into pre form using 35–40 tons/sq. in. pressure. If it is desired to apply the coating on a solid metal, an intermediate porous coating of powdered metal is sintered on first.

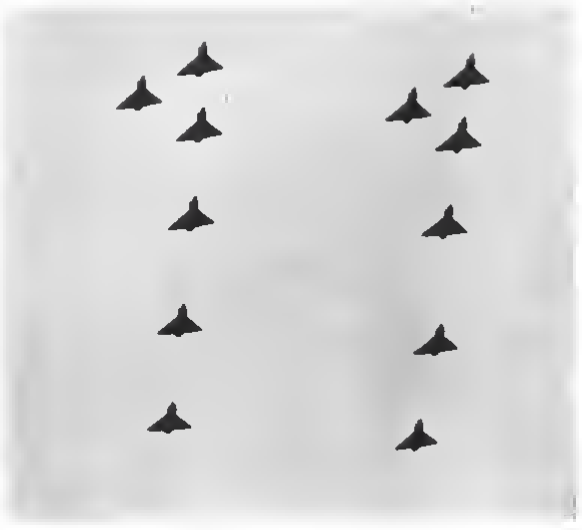
• Edges of pre-form are chamfered on grinder.

• Coating is dipped or sprayed on. This can be a liquid suspension of ceramic or ceramet ingredients, but Elraco

Short Exhaust on DC-3

Trans Texas Airways engineers have modified DC-3 exhaust pipes to a shortened version. The need for the long tail pipe was eliminated by the installation of a Janitrol heater, and TTA's engineering chief, Charles Baker. He estimated the deletion of the long pipe and nacelle recesses saved weight up to 80 lb. per aircraft, lessened cabin noise and vibration, and added thrust. Installation is complete on 60% of TTA's fleet, and the same modification is being made on DC-3s of the following airlines: North Central, Central, Ozark, Alleghany and Piedmont, as well as those of several industrial firms.





F-102As in Formotion

Twelve F-102A interceptors form a No 11 in a flyover at Duluth Minn., number represents the 11th Fighter Interceptor squadron, second Air Defense Command squadron to be equipped with the delta wing fighter. The flyover was part of a two day open house held by the 343rd Fighter group to introduce the F-102A to the public in the Duluth region.

recommends its Elkote 1010 formulation be used as a base for good adhesion

The liquid vehicle is removed from the coating by evaporation

• **Oven firing** is carried on at 2350F. for 20 min. The composition of the ceramic coating should be adjusted so that when the coated pre-form is placed in the controlled atmosphere furnace (preferably in a hydrogen rich atmosphere with a dew point of −70F or lower) and heated to a temperature at which the metal can properly be hot worked, the ceramic coating becomes plastic.

• **Work** is transferred rapidly to a forging die and given an impact blow (300 lb for the 2¾ long x ⅝ in sq laboratory samples). The dual result of the impact is "that the metal preform is coined to essentially 100% relative density while the plastic ceramic coating is driven into the preform's surface pores to form an intimate mechanical bond."

• **Ceramic dip**, oven firing and forging steps are repeated several times to build up the coating.

• **Last coat**, which is not forged, is dipped and given a final bake.

During the heat treating cycles an intermetallic transition zone between the metal and the ceramic establishes a secondary type of bonding—diffusion bonding.

This transition buffer zone makes for compatibility between the coating and the base metal despite their different thermal expansions.

Other Metals

The process can be used with many ceramic combinations and with metals other than molybdenum, according to Elraco.

Variation is the use of a chrome plating layer electroplated over the ceramic coating.

While attempts to use chromium plate directly over molybdenum have failed, Elraco says that when the chromium is applied over the coating, the ceramic layer prevents the two metals from migrating and diffusing intermetallically.

Carl Rex, development chemist at Elraco, and Lambert H. Mott, formerly with Stevens Institute, are credited with the discovery and development of this method.

Elraco has used its own money for most of the original work on this process because it did not want to jeopardize its proprietary rights by working with government funds.

THE MARK OF QUALITY

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Aircraft Controls

new lightweight, compact components for temperature and positioning controls on modern aircraft

The new spacesaving, weightsaving products illustrated are representative of the excellently engineered, precisely produced actuators, valves, and control boxes designed to match the industry's constant strides toward better military and commercial aircraft. For complete data, consult the Barber-Colman engineering sales office in your area.

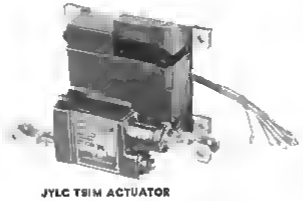
new lightweight actuators

PYLC ROTARY ACTUATOR

Standard unit is rated up to 10 pound inches. In one current application on an emergency fuel transfer valve, it drives 7.5 pound inch load 95 degrees in 0.2 second maximum. Weighs only 9 ounces. 1.38" diameter. 4.10" length. Powered by highly efficient Barber Colman motor.

SYLC LINEAR ACTUATOR

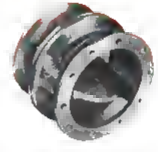
Weighs only 2.31 pounds. Designed for 150 pounds operating load and 20 G vibration. Maximum stroke 3½ inches. Available with integral radio noise filter, centering switches, and thermal overloads. Other new linear types with similar features for loads up to 1000 pounds.



JYLC TRIM ACTUATOR

Specially designed double jackscrew type for jet fighter application. Incorporates integral nonjamming, positive stops. Magnesium castings. Weighs only 4.3 pounds. Centers within 0.02 inch, coast less than 0.01 inch. Filtered to MIL-I-6181-b including switch transients.

new lightweight valves



STAINLESS STEEL CHECK VALVE

Floating pivot butterfly-type with venturi for aerodynamic operation. Allows air flow in normal direction, checks it in reverse direction. Tests of typical valves show no appreciable wear after 10,000 surge cycles, internal leakage 0.05 pound per minute at 110 psi, 90° F. Several sizes and flange types available.

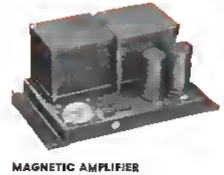
ALUMINUM BUTTERFLY VALVE

Two inch motor driven leak warmer valve designed specifically to fit limited envelope. Weighs only 1.7 pounds. Other stainless steel butterfly valves available for high pressure, high-temperature usage in air conditioning anti-icing, purge gas, and exhaust bleed systems.

ELECTROPNEUMATIC POPPET VALVE

Poppet type in ⅛ and 1 inch sizes for jet-pump and other shutoff applications. Extremely low pressure drop. Weighs only 0.7 pound. Operated with many combinations of temperature, pressure, and speeds. Typical internal leakage 0.05 lb/min at 300 psig 915° F.

new lightweight control boxes



MAGNETIC AMPLIFIER TEMPERATURE CONTROL

For pulse modulated floating, full proportioning, or cycling operations. Weighs as low as one pound. Ambient temperature from minus 65° F. to 250° F. Maximum reliability and life. Insensitive to normal shock and vibration, does not require shock mounts.

ELECTRONIC WINDSHIELD DEFOG CONTROL

Unit contains two channels for individual control of dual panels. No shock mounts required. Fully qualified including 30 G vibration. Many other electronic control units including panel-mounted types, available for cabin or compartment temperature control.

MINIATURE SEALED CONTROL BOX

For Micropositioner polarized relay-type temperature or remote positioning control. Hermetically sealed and miniaturized. Boxed dimensions 3" x 2¼" x 3¼". Weighs only 1.1 pounds. Less than one-third the weight, one-fourth the volume of earlier design.

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Barber Colman Company
Boeing Field
Seattle 8, Washington
Telephone: Mohawk 4828

Barber Colman Company
Ridgelea State Bank Bldg.
Fort Worth 7, Texas
Telephone: Parkhill 2-0370

Machinery & Equipment Sales
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Baltimore, Maryland
Telephone: Lexington 9-1311

Rousseau Controls Limited
449 DeCourcelle Street
Montreal 36, Quebec
Telephone: Glenview 3521

TRANSPARENCY of Type K rubber for supersonic safety glass can be seen in photo (left) by noting how clearly fingers of man's right hand show through sample. Picture at right shows how conventional safety glass (top) bubbles and loses shatter resistance at 375F. After several hours exposure at same temperature, panel using transparent rubber (bottom) remains clear and shatterproof.

Transparent Silicone Rubber Developed

By George L. Christian

New York—Two silicone rubber developments in unrelated fields now being made available in limited quantities by the developer, Dow Corning Corp., will help supersonic aircraft push farther into the thermal thicket.

Dow Corning's two materials:

- **Silastic Type K interlayer,** which has the quality of being completely transparent.
- **Silastic LS-53,** a new fluoro-silicone rubber which will perform well as O-ring or other seal material over a temperature range of –80F to plus 400F, yet resists swelling and attack by gasoline, jet fuels, engine oil and hydraulic fluids.

Among other attributes, silicone rubbers have excellent thermal stability characteristics and retain their room temperature plastic qualities over a very wide range of temperatures, approximately from –100F to over plus 500F.

An aircraft rubber parts fabricator, the Connecticut Hard Rubber Co. (AW June 11, p. 97), told AVIATION WEEK that, from its point of view, "LS-53 will be a great addition to the bill of possible materials for aircraft seals.

We have tested LS-53 in fluids known to attack conventional silicone rubber severely and have obtained outstanding results with the material."

Transparent Rubber

Silastic Type K interlayer was developed by Dow Corning in conjunction with the Air Force's Wright Air Development Center. Its current use is to replace the conventional plastic safety glass interlayer, polyvinyl butyral, in the windshields of supersonic aircraft.

Plastic cannot withstand the temperature extremes encountered by such fast-flying aircraft. At temperatures over 180F, the plastic interlayer softens, rapidly loses shear strength, and gives off gas bubbles. At –65F, the conventional interlayer becomes almost as brittle as the glass itself. At either temperature extreme, the plastic interlayer becomes incapable of preventing the glass from shattering if it is cracked.

With Silastic Type K used as an interlayer, laminated windshields retain full strength and clarity through the temperature range of –65F to plus 350F, according to Dow Corning. The company adds that "up to 160F, Silastic Type K laminated windshields have somewhat less shatter-resistance than conventional laminate. But the strength of the conventional plastic interlayer falls off so sharply above 160F, that, at 200F, the new silicone windshield is more than twice as strong as the conventional design."

WADC spokesmen told AVIATION WEEK that the transparent rubber interlayer "will find permanent use in aircraft flying at speeds which produce a temperature rise within the range of Silastic Type K."

Effectiveness Lost

Since the polyvinyl butyral interlayer loses its effectiveness at 160F and the transparent rubber's upper temperature limit is somewhat over 350F, these two temperatures would seem to give the range within which Silastic Type K will be used. At 40,000 ft. the speeds which produce such temperature rises are approximately Mach 1.3 (800 mph.) for 160F and Mach 2.3 (1,520 mph.) for 350F.

WADC says that a modified version of the transparent rubber, with higher thermal stability, is now in the experimental stage, but it is too early to predict the future of the new material.

The Air Force does not now foresee any other application for Silastic Type K other than as a windshield interlayer.

Silastic Type K is the result of over two years of development. In the uncured stage, the material is a soft, plastic, and extremely tacky sheet. It is calendered between layers of polyethylene coated paper. It requires no bonding adhesive and flows readily under pressure. Dow Corning says that, "When Type K is laminated and cured under pressure in either flat or curved glazings', it forms a tough, rubbery interlayer with excellent optical properties. Haze and distortion are minimized, and a high order of transmission is obtained over the entire spectrum. The new rubber is truly transparent."

Because of limited production facilities for the new rubber, the current price is $15.35 per square foot of 25-mil thick sheeting. Yet the demand from airframe manufacturers already exceeds the supply, according to Dow Corning.

Larger scale manufacturing facilities are now under construction at the company's plant at Midland, Mich. When completed early this year, Dow Corning says that the price of the product should drop substantially.

Techniques for laminating Silastic Type K between glass to produce finished windshield glazings have been developed by Libbi-Owens-Ford Co., Toledo, O., and Pittsburgh Plate Glass Co., Pittsburgh, Pa.

Non-Swelling Silastic LS-53

The Achilles heel of the heat and cold resistant silicone rubbers has been their poor resistance to the fluids commonly encountered in aircraft, as fuel, lubricants and hydraulic oils, these fluids cause swelling or destruction of conventional silicone rubbers.

Connecticut Hard Rubber points out that most solvents, fuels, and lubrication oils will cause only a swelling and a temporary loss of property of silicone rubber compounds. After the fluid is removed, the rubber regains its properties almost completely.

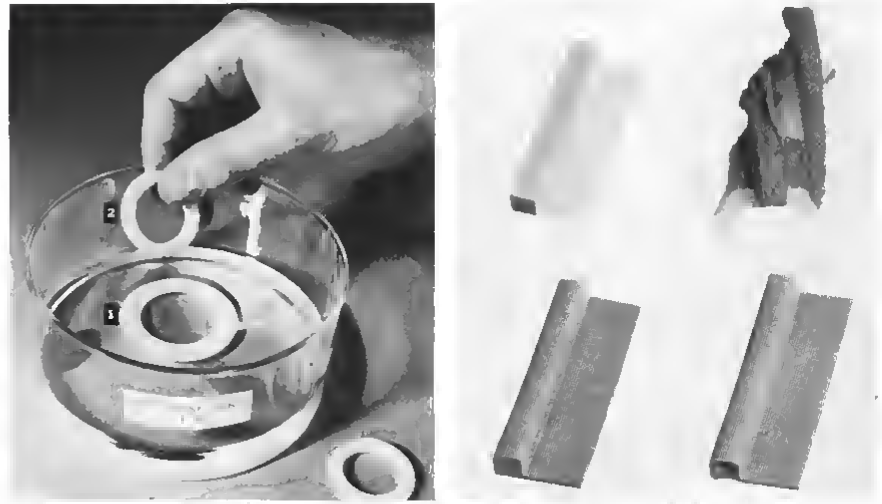
Certain other fluids, however, as aromatic lubrication oils, MIL-O-5606 hydraulic fluid, silicate ester hydraulic fluids, and diester oils slowly destroy the rubber by depolymerization and solution.

Silastic LS-53, developed by Dow Corning in cooperation with the Materials Laboratory of WADC, is a fluoro-silicone rubber which is resistant

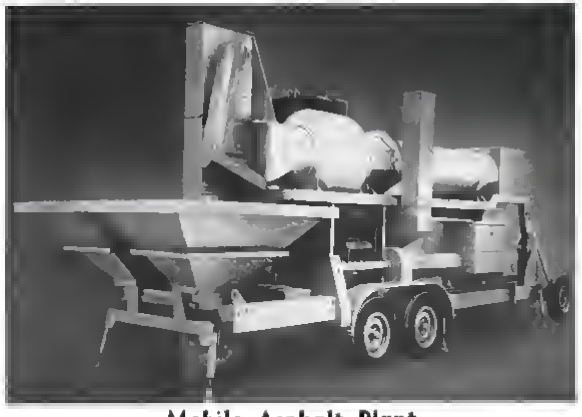
Oil and Fuel Resistance of Silastic LS-53

Test Fuel	Conditions	Silastic LS-53 Volume Change %	Silastic 50 Volume Change %
ASTM No. 3 Oil	70 hr./300F	5	63
MIL-H-3136 Type III 70% Iso-Octane 30% Toluene	70 hr./Room Temp.	20	225
MIL-O-7808 Diester Base Oil (Turbo Oil No. 15)	70 hr./350F	5	31
MIL-O-5606 Hydraulic Fluid (Univis J-43)	24 hr./160F	11	163
Phosphate Ester Hydraulic Fluid	70 hr./250F	11	10
Silicate Ester Hydraulic Fluid (Monsanto OS-45)	70 hr./350F	5	77

All samples were cured 24 hours at 300F.



CONVENTIONAL silicone rubber O-ring (1) swells to over twice its original size after 24-hours' immersion in JP-4 jet engine fuel. Identical O-ring of Silastic LS-53 (2) remains almost unchanged. Dacron-covered, conventional silicone rubber seal ruined by 16-hr. soak in 100/130 octane aviation fuel (upper right). Identical sample made with LS-53 (lower right) is unchanged after soak.



Mobile Asphalt Plant

Mobile asphalt plant can deliver 15-20 tons of hot asphalt mix an hour for resurfacing airport runways taxi strips and roads. The machine, called Model 1520 Roadmaster, is completely self-contained and fully automatic. It can be towed to wherever it is needed by any type of truck. Roadmaster is available with either a gasoline or diesel engine. It rolls on six pneumatic tires and stabilizer jacks are provided if the machine is used as a stationary installation. All thermometers, gages and controls are centrally located to make possible one man operation. Maker: Wylie Manufacturing Co., Inc., P.O. Box 7086, Oklahoma City, Okla.

to fuels and oils as well as to cold and heat. It is a molecular hybrid combining the best properties of two heat resistant materials—fluoro-carbon plastics and silicone rubbers.

It has a temperature range of —80F to plus 450F. While this is not as wide a range as the —100F to plus 500F range of some other silicone rubbers, its low-swell characteristics when in contact with aircraft fluids and lubricants make it ideally suited as a sealing medium in fuel, oil and hydraulic systems.

It will be used for O-rings, sealing wheel wells, inspection doors, bomb bay doors, ducts, diaphragms, boots and for aircraft hose. LS-53 has a wider temperature range of usefulness than any other solvent resistant rubber commercially available today, according to Dow Corning.

Pilot Plant Production

Silastic LS-53 is in pilot plant production. The quantities being made are being restricted to essential military aviation applications.

Connecticut Hard Rubber says it is fabricating LS-53 in limited production quantities and is in the process of designing a number of aircraft parts around the material.

Cost of the fluoro-silicone rubber is $30 a pound.

Dow Corning cites these disadvantages for LS-53: it is difficult to fabricate by extrusion or calendering methods, and it is not as resistant to diester fluids (such as Esso Turbo Oil 15) as it is to hydrocarbon fuels and oils (such as MIL-O-5606 hydraulic fluid).

Other organizations which cooperated in the research for the fluoro-silicone rubber are Purdue University Research Foundation, which indicated the feasibility of a fluorinated silicone rubber, and Peninsular ChemResearch, Inc., of Gainesville, Fla., which produced a key fluorinated silicone intermediate compound. However, a method of making the compound rubbery eluded all those working on the material at that time.

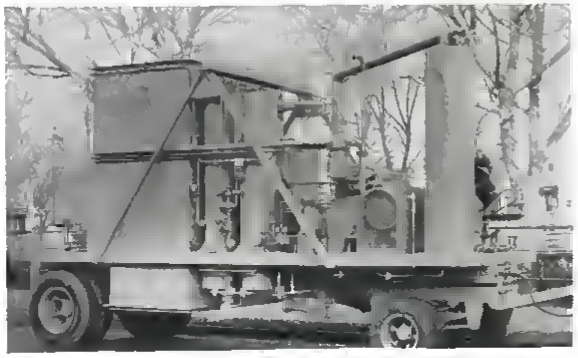
Dow Chemical, which had been interested in a similar product for commercial use, was asked to experiment with the new compound, using its own research funds. The company soon succeeded in polymerizing the intermediate compound, giving it the flexibility of rubber.

British Manufacturer Develops Ream Method

London—One of Britain's oldest aircraft manufacturers has developed a new machining technique which it claims can substantially reduce the production and overhead costs of the country's engineering industry.

The development comes from Short Brothers and Harland, Ltd. of Belfast. It is a new method of reaming, involving the enlargment, to extremely accurate standards of holes pre-drilled in metal.

The technique—already successfully applied in the production of components for British airliners and for flight controls of other types of aircraft



Helium Purifier

This mobile rig is a helium purifier, used periodically to purify the helium in Navy blimps when the gas becomes contaminated. The impure gas is drawn from the bag by a gasoline engine-driven compressor and is purified by first being passed over drying beds and then by being condensed through a refrigeration system. The helium is either returned to the blimp's gas bag or is stored for future use. Compressors, engines, pumps and cooling tower are on front of trailer and drying beds are in square structure at the rear. Six units have been built for the Navy by York Corp., subsidiary of Borg-Warner.

Cougar Over Fuji

An F9F 6P fighter photo plane flies over Mt Fujiyama, Japan. The picture was taken by another Navy fighter photo plane flying overhead.

-simultaneously imparts a high standard of finish to the metal

Until now, the standard practice of reaming high tensile steels by means of a tool having spiral cutting edges has been laborious, failing to produce holes of consistently high finish. Expensive components often are badly scored and have to be scrapped, while tool maintenance has been costly and difficult.

With the new method now in use at Short for aircraft undercarriage components, wing root fittings and rudder bars, holes are reamed in a fraction of the time normally needed.

For example, a hole one inch in diameter and four inches deep can be reamed in 24 seconds against 20 minutes required by standard methods, the company says.

The new method, in fact, takes a page from an old book.

In effect, it is a revival of the old fashioned gun drill, which was used mainly for drilling gun barrels and other components having deep and extremely accurate bores.

Martin Builds Test Tower for Vanguard

Special test and assembly tower has been built for the Vanguard satellite carrier by Glenn L. Martin, prime contractor for the carrier. Called the Vanguard Vertical Check Out Tool, it stands 97 ft. tall and has five floor levels for assemblers and testers.

It is supplied with light, heat, water, electric power and water drainage. A two ton crane with exceptionally precise operating controls aligns the three stages in the assembly operation.

Static firing of the Vanguard vehicle can be simulated in the checkout tool. The entire structure is designed to be disassembled and re-erected at another site.

It is built of heavy structural steel and reinforced concrete. Walls are made of thin steel sheet separated by four inches of insulation.

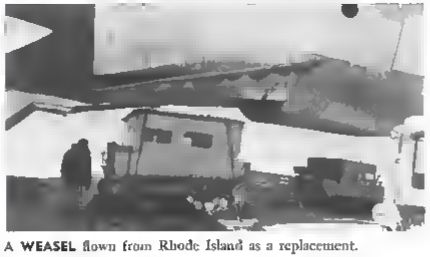
Translucent Fiberglas windows admit daylight.

TACTICAL AIR COMMAND'S 63rd Troop Carrier Wing is flying Douglas C-124s airdrop at McMurdo Sound, South Pole.

Douglas C-124s in Antarctic Airdrop

DR. PAUL SIPLE (left) deputy in charge of Antarctic Programs; Rear Admiral George Dufek, Commander of Navy Task Force 43, Maj. Gen. Chester McCarty, 18th AF Commander, Col. Horace A. Crosswell, Task Force Commander for the mission.

C-124 is loaded for one of sixty airdrops.



A **WEASEL** flown from Rhode Island as a replacement.

SNOW-CAT from the states emerges from C-124.

CREWMEMBERS refuel in bitter antarctic cold.

VERTOL H-25 helicopters are checked by mechanics at Ft. Rucker

BELL H-13s get line maintenance in open air hangar

CESSNA L-19 trainers receive line maintenance outdoors on perforated metal hardstands.

Hayes Overhauls Army Aircraft

U. S. Army's major aircraft overhaul depot is operated at Ft. Rucker, Ala., by Hayes Aircraft Corp., Birmingham, Ala., which has 947 employes at Ft. Rucker and occupies 45 buildings.

Responsible for overhaul and IRAN (Inspect and Repair as Necessary) service on 514 aircraft assigned to the Army Aviation School (of which 266 are rotary wing types) Hayes receives assistance from technical representatives of Vertol, Hiller, Bell, Sikorsky, Beech, Continental Motors and Air-cooled Motors (Franklin).

The Army supply system provides spare parts; top overhaul on engines is handled by the manufacturer or other contractors.

HILLER H-23s are shown on flight line and operations area

CESSNA LC-126s undergo overhaul in Ft. Rucker hangar.

Aeronautics in Poland

Twin-jet Russian-designed Ilyushin 28 jet bombers (above, right) form a major portion of the Polish air force. Designed by Sergei Ilyushin, they have been built in satellite countries along with the MiG-15 and presumably the MiG-17. These views emphasize the bulk of the manned tail turret and the thin wing section. Bombers (NATO code name Beagle) also have been reported in Red Chinese service. Polish training planes are Jak 11 (below) and TS-8 (right). TS-8 has Polish produced engine WM-3 with 340 hp, 2,500 rpm-, is designed by Narkiewicz. Models of a simple finned rocket and boosted aerodynamic research rocket with Mach 4 design speed are shown below, far right. Picture was taken at first astronautical exhibit in Poland at the Technical Museum which organized show in cooperation with Polish Astronautics Society.

Polish Aircraft

Polish helicopter of the SM-1 type (above) manufactured by the Transport Equipment Factory in Swidnik, Lublin Province, Poland, with engines imported from Soviet Union. About 15 were to have been turned out by factory by end of year. Helicopter with 575 hp engine carries three passengers, makes 200 km per hour, reaches 5,000 meters altitude and ranges to 300 km. Soviet Il-14 (below) of the Polskie Linie Lotnicze (LOT) on the ramp at Okecie Airport at Warsaw. LOT flies from Warsaw to Amsterdam, Belgrade, Moscow, Paris, Vienna, Stockholm and other European cities

Titanium Prices Decline in 1956

Steeply declining price curves marked the year 1956 for the six-year-old titanium industry. Production volume was up due to greater use of the metal in aircraft, and heavy capital commitments will more than double production in 1957.

Among technical advances reported were new high levels of metallurgical quality, expanded recycling of mill scrap and the beginning of production of heat-treated alloy sheet of unprecedented strength and uniformity of size.

Production of finished mill shapes totaled 10,600,000 lb., about 25% more than the most optimistic first-of-the-year estimates. Estimated value was about $130 million. Total sponge production was 29 million pounds. An additional 3½ million pounds was imported from Japan. Sponge production estimates for 1957 range between 50 million and 56 million pounds.

Imports of sponge are expected to rise as deliveries are made under a barter agreement with the Commodity Credit Corporation. Commercial producers of sponge continue to favor magnesium and sodium as reducing agents in the extractive process.

Army Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Army Contracting Offices.

CORPS OF ENGINEERS, Office of the Division Engineer, New England Div., 457 Commonwealth Ave., Boston 16, Mass.:

A. J. Martini, Inc., 9 Jerome St., Medford, Mass., modifications to D. C. maintenance hangars, Portsmouth AFB, Portsmouth, N. H. and Westover AFB, Chicopee Falls, Mass., job (DA 19-010-ENG-4021), $230,600.

Structural Concrete Products Corp., 10 E. 40th St., N. Y., 10, N. Y., furnish & fabricate flush runway lighting fixtures and spare parts for Dow AFB, Bangor, Maine, job (DA 19-106-ENG-4305), $115,039.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Air Force Contracting Offices.

AERONAUTICAL CHART & INFORMATION CENTER, Air Photographic & Charting Service (MATS), USAF, Second & Arsenal, St. Louis 18, Mo.:

Photogrammetry, Inc., 7961 Eastern Ave., Silver Spring, Md., preparation of acetate plots from aerial photography by USAF standard indexing system, $450,000.

SAN ANTONIO AMA, Kelley AFB, Tex.:

Cline Electric Mfg. Co., 3402 W. 47th St., Chicago 32, Ill., regulator, voltage, S/N 6457-9200A04, 101 ea., (Purchase Request SA-530700, complete), $88,235.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 6, N. J., aircraft electrical spare parts (see attached exhibit "A") (Purchase Request SA-539650, complete), $42,284.

TOPEKA AIR FORCE STATION, Topeka, Kan.:

Carbide & Carbon Chemicals Co., A Div. of Union Carbide & Carbon Corp., 30 E. 42nd St., N. Y. 17, N. Y., deicing, defrosting fluid, 40122 Gal., (IFB 14-604-57-80), $40,924.

Monadnock Mills, 1077 First Ave., San Leandro, Calif., Stud, cowling fastener, 120800 ea., (RFP 14-604-57-5155), $33,317.

Tulon Inc., Meadville, Pa., fastener, allen interlocking, 70000 ea., (RFP 14-604-57-5235), $42,336.

Monarch Products Co., 30 Manhan St., Waterbury, Conn., bolt, 5500 ea., (IFB 14-604-57-224), $33,055.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J., nut, 635000 ea., (RFP 14-604-57-5121), $282,807.

General Motors Corp., Allison Div., Plant No. 8, Indianapolis, Ind., special tools and equipment for J33 engines for F-80 aircraft, 40 ea., (RFP 14-604-57-5154), $62,604.

Carbide and Carbon Chemicals Co., A Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., N. Y. 17, N. Y., deicing, defrosting fluid, 40440 gal., (IFB 14-604-57-60), $41,294.

National Utilities Corp., 826 S. Arroyo Pkwy., Pasadena, Calif., clamp, stainless steel, 40000 ea., (RFP 14-604-57-5081), $58,000.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J., nut, self-locking, steel, 1070000 ea., (RFP 14-604-57-5149), $46,760.

Shell Chemical Corp., 460 Madison Ave., N. Y. 17, N. Y., alcohol, special denatured, 92.4 percent ethyl, 600000 gals., (IFB 14-604-56-1106), $53,000.

Shaw & Estes, 1407 S. Akard St., Dallas, Tex., test stand, turbo jet engine, 2000# thrust capacity, single unit, universal, semi-portable, 13 ea., kit conversion, test stand, 32 ea., (RFP 14-604-57-5234), $2,146,032.

Carbide & Carbon Chemicals Co., A Div. of Union Carbide & Carbon Corp., 30 E. 42nd St., N. Y. 17, N. Y., ethyl alcohol, 99500 gals., (IFB 14-604-56-246), $51,264.

U. S. Industrial Chemicals Co., A Div. of National Distillers Products Corp., 99 Park

Ave, N Y 16 N Y ethyl alcohol 46665 gals (IFF 14-004-56-286) $26 097

Handy & Harman, 82 Fulton St N Y 38, N Y solder, silver wire brazing, 74468 troy ounces (IFB 14-004-57-458) $43 630

Daus Fosteoer Co Inc., John St. Babylon N Y stud 68000 ea (RFF 14-004-57-5086) $28 440

AMC, Wright-Patterson Air Force Base, Ohio

McDonnell Aircraft Corporation Lambert Field St. Louis Mo flight test program on F101B (PR FH 633683) $2000000

Lockheed Aircraft Corporation Burbank Calif. implementation program for RF 104 A (PR FH-633515) $1000000

North American Aviation, Los Angeles International Airport Los Angeles 45 Calif. F-100D aircraft, microfilm 205 gallon droppable fuel tanks AIR-20, 100 ea. (PR PH 671760) $21668400

The Glenn L Martin Company, Baltimore Md. modification of RB-57A airplane for special purposes (PR 4831) $136217

Hendix Products Div Bendix Aviation Corp. South Bend 20 Ind wheel assemblies for C 119, F-26 and F80 aircraft, brake assemblies for C-97 and B-50 aircraft, (PR 00542951) $2870000

Norco Industries 20 Curtice Street, Rochester N Y press laminating plate PM-30 in a/w MIL-P-12092 140 ea. platen for laminating press 30 ea. (MIPR R-56-6405-SC-24 and R55-2875-SC-SMD) $79077

Sperry-Rand Corp., Sperry Gyroscope Division Great Neck, N Y generators 82 ea amplifiers, 171 ea. engineering data, labor 250 (PR 630966) $140800

The Leland Electric Company Division, American Machine and Foundry, Dayton, Ohio motor generators, 2250 VA, 883 ea. (FR 760055 and 736005-1) $137410

The Leland Electric Company Division, American Machine and Foundry, Dayton Ohio motor generators 250 VA 403 ea. (MIPR R56-6302 & R56-6825) $122000

The B F Goodrich Co., 803-4 Winters Bank Building Dayton 2 Ohio wheel assemblies for RF-84F aircraft brake assemblies for RF-84F aircraft (FR PE-671612), $1825011

Lear, Inc, 110 Ionia Ave Grand Rapids 8 Mich, power unit assemblies P/N 4287-156CK, 76 ea power unit assemblies P/N 4287-157V3 126 ea actuator P/N 4227-461AP3A, 66 ea; (FR SA 666632Q) $86022

R. C. Allen Business Machines, 676 Front Ave., N W Grand Rapids Mich. indicator turn and slip, type MD-1A, 870 ea. (FR PE 670646) $67675

Bendix Aviation Corp., Utica Division Utica N Y, starters electric P/N 4213-646961, 637 ea. (MIPR R56-6846 & R56-6184 FR SA 666647) $51271

Aerol Machine and Tool Corp., 3837 36th Street Long Island City 1 N Y, belt, aircraft safety lap type MD-1 and MD-2 11074 ea. (MIPR-R-56-6036 (Army), FR OC-666664, OC-766462, OC 765466 SA-662016, T3MCLF-56-17 (ARMY), $75-795

Irving Air Chute Company, Inc., 1675 Versailles Road, Lexington Ky., belt, aircraft safety lap troop, type MC-1, 16166 ea. harness aircraft safety personnel retaining type MA-1 195 ea. (FR OC-6698-66, OC-646316, SR-563804, PE-673470), $63469

The Goodyear Tire and Rubber Co., 1144 East Market Street, Akron 16 Ohio wheel assemblies 765 ea. brake assemblies, 226 ea. (FR OO-467763 and 646500) $1311718.

American Machine and Metals, United States Gauge Clymer Ave. Sellersville Pa., indicator, pressure, 0-60 PSI, fuel pressure, aerno 61-2311 type C-33 1230 ea. gage, pressure, manifold, type MS-28016-1, aerno 61-2612, 500 ea. gage, gen high pressure, type AN-6771-T46 aerno 61-2350, 6430 ea. (FR PE 635976 PE 635670) $71466

The Goodyear Tire and Rubber Co., 1144 East Market Street Akron 16 Ohio, brake assemblies 523 ea. wheel assemblies 338 ea. (FR 671354 671357, 467054) $122802

Bendix Aviation Corp. Bendix Products Division, South Bend Ind, brake assemblies for F86 aircraft, (PR 56-542749), $1370256

Viewlex, Inc., 95-01 Queens Boulevard,

Long Island 1, N. Y., lens, condenser 58.4F/1g, u/w projector type AP 9(1) 2343 ea., motor (MP-48) u/w projector type AP 9(1), 212 ea., lens, condenser 61.8 F/1g u/w projectors type 8(1) 1741 ea. (MIPR R-02-590015-SC-01-23, Amend. #4 and #5 R-10-8435-SC-24, R-56-8435-SC-24) $30038.

American Machine and Metals, United States Gauge Division, Sellersville, Pa., transmitters type MS28085-5 nsn'd 61-1465 1236 ea. (PR 676656) $75436.

Sperry Rand Corp., Sperry Gyroscope Company Division, Great Neck, N. Y., switch, selector, cycle engine analyzer 28 cycle 98 ea. (PR MA 718585) $26134.

Bendix Radio Division, Bendix Aviation Corp., Baltimore, Md., radio compass: R-101B/ARN-6, 2412 ea., control panel C-1513A/ARN-6 448 ea., control panel C-1514A/ARN-6 1161 ea. (PR 670786 581451 589403 784752 188883, MIPR 56-841-188 02 598173-SC-01-28 02-59 8173 SC-01-23 amendment 1 and 2), $11548858.

The Multitek Company, 150 West Ivy Ave., Inglewood, Calif., launcher, rocket airborne training type MA-2, 4566 ea. (PR WR 407878) $182421.

Radio Corporation of America, Front and Cooper Streets, Camden 2, N. J., radio control box C-465/ARC 560 ea. (PR 188088 and 642902) $84421.

Grimes Manufacturing Company, Urbana, Ohio, light assemblies 33 ea. (PR SA-811270 and SA-811288 Q) $74589.

Ainsworth Manufacturing Corporation, 2256 Franklin Street, Detroit 7, Mich., rack, bomb, aircraft, electrically operated, type MB-3 8982 ea., spare parts, technical and maintenance data, lot (PR 589147, 589147-1 and 589154) $1432897.

Sam Orleans and Associates, 211 West Cumberland Ave., Knoxville, Tenn., production of motion picture project 18188 1 ea. (PR 564575) $30891.

The Newton Company, 55 Elm Street, Manchester, Conn., study and modification of trainers, engine analyzer type MG-1 and pattern drums 58 ea. (PR 671156), $123204.

WHAT'S NEW

Reports Available

▪ **The Experimental Production** of Thin Ferrite Films and a Survey of the Magnetic Properties of Thin Films (PB 121177)—by R. J. Miller, Naval Research Laboratory, $1.25; 46pp.

▪ **Magnetic Properties** of Low Permeability Alloys (PB 121169)—by T. R. McGuire and F. S. Smart, Naval Ordnance Laboratory, 50 cents, 18pp.

▪ **Controlled Atmosphere Melting** of Magnetic Materials (PB 121168)—by J. F. Nachman and W. J. Buehler, Naval Ordnance Laboratory, 50 cents, 18pp.

▪ **Development and Evaluation** of Coated Fabric for Cold Weather Clothing (PB 121116)—by R. Briganti, Navy Clothing Supply Office, 75 cents; 25pp.

▪ **The Effect of Five Synthetic Lubricants** on USAF Fabrics (PB 121395)—by R. A. Sublette, Wright Air Development Center, 50 cents, 19pp.

▪ **The Development of High Strength** Nylon Parachute Fabrics (PB 121400)—by H. J. Bickford, T. L. Rusk, Jr., and D. K. Kuehl, Cheney Brothers for Wright Air Development Center, $1.00, 39pp.

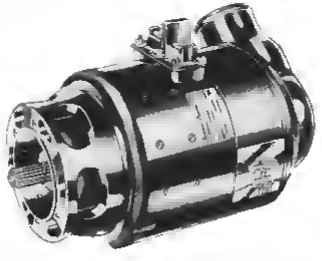
AIRLINE ENGINEERS

READY YOUR PLANES

Jack & Heintz G23-5 d-c Generator

Rating, continuous (amps)	450
Voltage, d-c	30
Speed range (thousand rpm)	4 8*
Weight (lb)	67
Over-all Dimensions—inches	
Length (from mounting flange)	13½
Diameter	8
Bolt circle diameter	5
Spline pitch diameter	6.8
Air inlet conn., OD	3
Cfm of air @ 6" H2O and 6000 rpm	165
Rotation as viewed from end opposite flange	CW

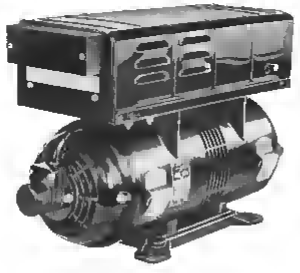
*At 24 volts with 0.75 ohms in shunt circuit



Jack & Heintz F45-10 Inverter

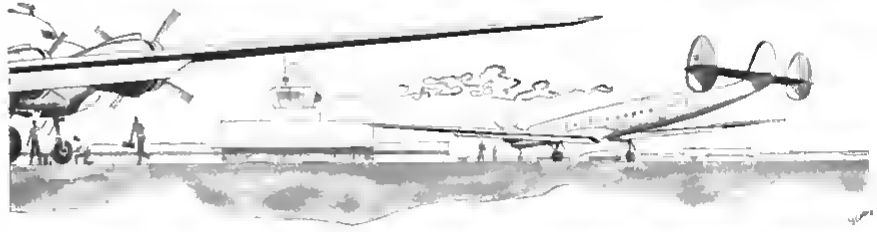
	Single Phase*	Three Phase
Output Rating		
Full Load	3000 va	3000 va
Rated a-c Voltage	115	115
Line Amps	24	15
Nominal Frequency (cps)	400	400
Power Factor	95% Lag to 95% Lead	
Rated Input Voltage—d-c	27½	27½
Input Amperes—d-c (at Rated Voltage)		
No Load	44	44
Full Load	185	185
Over-all Dimensions—inches		
Length	17¾	
Width	7¼	
Height	11¾	
Weight—Pounds	54	

*Load across terminals 8A



FOR ANTI-COLLISION SYSTEMS!

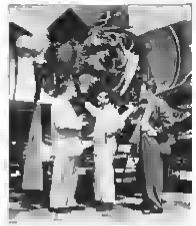
With anti-collision systems slated for early installation, and with weather radar now aboard or planned, your planes will need considerably more electric power. Anticipating this need, Jack & Heintz has developed and flight proved a 450-amp d-c generator and a 3000-va inverter. Flight tests have shown the units to be ideal for commercial use. By simply replacing existing generators and inverters...on a 1-for-1 basis...you can effect system power increases of 20% or more. And you get this added power with very little weight penalty.



450-AMP GENERATOR

Comparable in size and weight to present lesser power machines, the J&H G23-5 mounts readily on such universally used reciprocating engines as Wright R-3350 series and P&W R-2800 series.

Because more power is obtained with the same number of generators as now in use, you keep system complexity down. And by eliminating the need for additional generators you save accessory pad space which becomes more important as new electromechanical, pneumatic and hydraulic devices are developed for airline use.



J&H field engineers consult with airline personnel on installation of G23-5's

3000-VA INVERTER

Designed after the popular J&H F45-5 (2500 va) which is used extensively by airlines, the J&H F45-10 gives 500 va more power while weighing only ½ pound more.

Approximately 90% of the parts used in the F45-10 are completely interchangeable with the F45-5 . . simplifying maintenance and stock problems. If you are now using F45-5's you can convert them quickly to a 3000-va rating with a special kit available from Jack & Heintz.

Three J&H F45-10 3000-va inverters installed on Douglas DC-7C

BOTH POWER UNITS ARE AVAILABLE IMMEDIATELY

Consult with J&H engineers or write for further data to: Jack & Heintz, Inc., 17635 Broadway, Cleveland 1, Ohio
Export Department: 13 East 40th Street, New York 16, New York.

JACK & HEINTZ AIRCRAFT ELECTRIC EQUIPMENT

Lightplane Production Needed in Brazil to Bolster Air Taxi Boom

Rio de Janeiro—Use of lightplanes for air taxi operations is booming in Brazil. One air taxi pilot reports that in one month he netted more than $1,500 with a Cessna 170. In 1950 there were nine taxi aircraft registered in Brazil, now there are nearly 500.

Officials of this country's counterpart of the U.S. Civil Aeronautics Administration say that the time is ripe for someone to produce lightplanes in Brazil capable of operating into small airstrips and unprepared fields. AVIATION WEEK was told by aviation officials here that two U.S. lightplane manufacturers have discussed this possibility.

Among the reasons for increased activity by air taxi companies is that in the rainy season, the roads in some areas become virtually impassable and businessmen and ranchers find that they spend considerably more time on the comparatively short legs from the airport of destination to their operation in the interior than during the scheduled airline portion of the trip.

New Taxi Pattern

The pattern of air taxi operation in Brazil is changing, with the airlines improving services around the major cities. Thus air taxi operators are moving farther into the interior. One pilot, Atlas B. Castanhede, built 120 landing strips in five years in Rio Branca to serve mines and ranches. In Parana, a coffee area, the town of Marmga wasn't even a village 10 years ago. Six years ago it had about 2,000 inhabitants—now there are some 30,000.

It has a clay runway for airliners but when it becomes wet it is unusable and lightplanes fly passengers to a paved strip at nearby Londrina. Lightplanes are also used to land at plantations, since, when it rains the ride from them to the airport takes nearly a day by surface travel; by lightplane it requires about a half-hour.

Company Airplanes

Though business flying is still in its infancy in Brazil there are some 70 industrial and commercial firms that operate their own aircraft. It is believed that there are many more business planes.

Many airplanes are registered as private aircraft in the name of company executives who probably use them almost exclusively on business. In 1950 there were less than 1,900 private aircraft registered in this country, now there are more than 2,300.

Among the business plane operations there is the Lintorna Wyeth pharmaceutical firm in Sao Paul, which has six aircraft, including a twin-engine Saab Scandia for executive travel and as a public relations aid, such as bringing doctors to conventions. A plantation in Matto Grosso has six lightplanes and 12 private airstrips to facilitate coverage of its hundreds of thousands of acres.

For a Sao Paulo or Rio de Janeiro businessman who is in a hurry to clinch a coffee deal in Parana, a lightplane is as necessary as a car. In fact, a car and a plane cost approximately the same in Brazil. Also assisting the spread of executive travel by company plane are the many U.S. companies operating in the area with their own aircraft.

A check of registrations shows that the Cessna types seem to be most popular. According to one of the managers of Cia. Star, an air taxi operation in Sao Paulo, the Beech Bonanza used to be their standby when the company worked into the major cities. With the move to services in the rugged interior, a high-wing type with fixed landing gear be-

U. S. BUSINESS & UTILITY AIRCRAFT SHIPMENTS

(January-November 1956)

Make and Model	Aircraft		Builder's Net Billing Price	
	Nov.	Jan.-Oct. Total	Nov.	Jan.-Oct. Total
Aero Design 560-A		48		
680	N.A.	86	N.A.	$9,524,000
Beech 35 Bonanza	18	605		
E18S Super 18	11	91		
D18S	0	6	$1,947,436	24,948,337
50 Twin-Bonanza	3	155		
Model 45 Trainer	10	60		
Calloir A-4	2	16		
Super Cadet	1	0	18,118	91,418
Comair 480 Twin-Navion	0[1]	16	0	424,830
Cessna 170	0	72		
172	18	1,390		
180	0	465	1,829,828.02	32,791,163.18
182	30	810		
310	12	199		
Champion 7EC	22	176	91,600	698,403.46
Colonial C-1 Skimmer	2	6	84,000	102,000
Hello H-391B Courier	2	23	46,000	518,000
Mooney Mk 20	5	60	51,000	640,006.65
M18C	0	9		
PacAero[2] Learstar Mk. 1	1	7		
Learstar Mk. 2	0	1	450,000[4]	2,848,000
Piper PA-18 Super Cub	12	235		
PA-18A Super Cub	19	398		
PA-22 Tri-Pacer	99	971	2,095,994	20,588,594.84
PA-23 Apache	38	362		
Taylorcraft Model 20	4	33	38,000	294,915.23
Trecker[3] P. 136-L1	6	11	0	693,500
Totals	309	6,311	$6,601,976.02	$94,363,167.56

Source: Compiled by AVIATION WEEK. [4] Approximate. [1] Production discontinued. [2] New Pacific Aeronautical Corp. division, which took over Lear Aircraft Engineering Division as of Nov. 1, 1956. [3] Formerly Royal Aircraft Corp.

came more desirable Cia Star has a half dozen Cessna 170s on order When all the taxes, stamps and other services are paid, the airplanes will cost the company some $18,000 each

High Costs

This cost is a big handicap for any company particularly since the buyer has to have his money deposited well in advance because of Brazilian import regulations Then there is a six months or longer wait for delivery

Maintenance also is expensive some spark plugs cost about $12 each for light engines they run approximately $4

There is some hope for the future with the expansion of heavy industry in Sao Paulo. Aircraft fabric is no problem, Brazil actually exports this item to the U S and abroad Some aircraft parts can also be made to order in the many good maintenance shops available One of these places is located at Varig Airline's Port Alegre base.

Bush operations can be extremely costly, particularly because of fuel prices The oil companies have fairly good distribution in Brazil, but obviously they cannot service all of the out-of-the-way stops made by air taxi services In the interior, airports receive their fuel from the airlines or the Air Force, which flys it in via C-46

Also, to aid the expansion of the government's oil monopoly Petrobras private pilots must buy a special license on the following scales $80 annually for aircraft with engines up to 150 hp., $160 for engines to 450 hp If an aircraft owner can prove that his operation is a commercial necessity, and this is difficult to do, he will pay one tenth these fees In addition, there are other licenses pilots must have.

USAF Flying Clubs Flourish Abroad

Washington, D. C.—Flying clubs are flourishing at U S Air Force stations abroad, according to reports received by the Civil Aeronautics Administration. CAA agents abroad report considerable activity at foreign bases where they serve as advisors to the new pilots and check equipment for airworthiness

For example at Tachikawa, near Tokyo, 185 officers airmen civilians and dependents working for the Air Force belong to the Tachikawa Aero Club, which owns three planes, a Stinson L-5, an Aeronca and a Taylorcraft Some 150 of the club membership are student pilots and the five part-time instructors are unable to handle the line of new applicants

The club operates from a 3,200 ft runway at Camp Chofu some 10 mi to the southeast of the station and is installing two way radio for cross-country work

Yokota Aero Club was the first organized in Japan About one year old, it has more than 60 members and flies two Stinson L-5s, which it had to assemble and repair before starting operations

Another Air Force flying club is at Hickam Field, Hawaii with 51 active members It owns one airplane and has three others in prospect In England there are about 15 flying clubs at Air Force stations to keep pace with their needs, the CAA's London representative designated an Air Force major and a captain as CAA airmen examiners

Helicopter Service Starts in Philadelphia

Bell 47G helicopter air taxi service carrying passengers and cargo was started early this month in the Philadelphia, Pa., area by Delaware Valley Helicopters, a division of Engle Flying Service, Inc., Bristol President of Engle is Harold Hayden, Cessna dealer in the area If the service proves lucrative, the company plans to buy additional rotary wing equipment, possibly a 12-passenger type

DVH is flying twice daily schedules linking Philadelphia International Air-

New Australian Lightplane

Four-place Fawcett 120 all-metal lightplane is powered by a 145-hp. DH Gipsy Major engine and has a cruise speed of 106 mph., top speed of 127 mph. Built in Bankstown, Australia, the aircraft was designed by Luigi Pellarin, who also laid out the new FL-7 spray/dust biplane (AW Nov. 5, p. 134). Initial rate of climb of the Fawcett 120 is 550 fpm., range is 500 mi. Span is 35 ft. 8 in., length is 27 ft. and wing area 185 sq. ft.

port with the new Ft. Washington, Pa., industrial center, North Philadelphia Airport and the Bristol-Levittown area. Schedules call for the Bell helicopter to leave the Bristol-Levittown area at 7:15 a.m., arriving at North Philadelphia airport at 7:25. It leaves there at 7:30, arriving at Philadelphia International at 7:50, leaving at 8:15 and arriving at Ft. Washington at 8:25. The second flight starts on the V-shaped route at 1:15 p.m., lands at International Airport at 1:50 and at Ft. Washington at 2:25.

On the return trip the service arrives at International at 2:55, stops over until 4:15 and arrives back at home base at 4:45. Additional stops may be made later depending upon demand.

The schedules are set up so that the helicopter will arrive and depart from International Airport at airline arrival and departure peaks.

Japanese Firms Receive B-57 Repair Orders

Tokyo—The Kawasaki Aircraft Company has accepted an order from the U. S. Far East Air Force for the repair of seven B-57 jet bombers. This is the first time the U. S. Forces has entrusted its jet bombers to a Japanese aircraft company. Until now, only jet fighters and trainers have been repaired or overhauled in Japan.

According to Kawasaki, an additional order for the repair of 13 more B-57s is expected shortly. The USAF is also reported planning to ask Japan to overhaul supersonic jet fighters in the near future.

Preflight Fuel Drains To Remove Water, Dirt

Importance of preflighting the quick drains in lightplane fuel tanks is highlighted by a report in a Illinois Department of Aviation Bulletin.

A Civil Aeronautics Administration maintenance inspector, investigating the crash of a lightplane following engine failure after takeoff, queried an airport operator as to whether maintenance personnel checked pipe plug outlets for water. The operator replied that they didn't, that pilots were always instructed to drain the gascolator, believing that this took care of the condition since it was the low point in the aircraft.

A check was made of three airplanes on the line. The first appeared never to have had the pipe plugs removed. Considerable water and sediment came out of each tank, the report notes. The next airplane showed no evidence of water, but there was an unusual amount of sediment and dirt. On the third plane, the pipe plug was removed entirely and nothing came out. A screwdriver was placed in the drain outlet breaking up an unusual amount of material. On the right tank, fuel came out in a fast drip until a screwdriver was inserted, again breaking up considerable corruption. The amount of dirt taken from the tanks was considered hazardous.

Following this line check, the operator immediately instructed his chief mechanic to remove all pipe plugs for water and sediment checks in future inspections.

New Developments in Aircraft . . .

TRI-TRAVELER is latest addition to line of Champion Aircraft, Osceola, Wis. Deliveries started in January, listing at $5,875. Models with tailwheel gear sell for $5,475 and $4,875.

RADOME on Aero Commander 680 is offered in kit form by Chamberlain Aviation Corp., Akron, Ohio, for new business plane radars. Installation requires no structural changes.

MODERNIZED T-6 with tricycle landing gear, tip tanks and power pack having jet stacks, augmentor cooling is scheduled for flight in February by Erle L. Bacon Corp., Santa Monica.

EXTENSIVELY *MODIFIED* P-38, one of five surplus Lockheed Lightnings used by Hycon for aerial surveys costs about $25,000 for basic airframe, another $25,000-$70,000 for rebuilding. High-altitude, long range camera planes have normal nose lengthened eight feet.

P-38s Adaptable for Photo Survey Jobs

Pasadena, Calif.—Aptitude of the World War II twin-engine Lockheed P-38 Lightning fighter for high altitude natural resources survey is attested to by Hycon Aerial Surveys Inc. The Pasadena firm now is negotiating for an additional two P-38s to augment its current fleet of five.

Although these surplus P-38s are scarce, and expensive, Hycon considers them the best suited and most economical airplanes for high-altitude survey operations.

Aircraft utilization is high in the past two years Hycon crews have flown their five P-38s over 700,000 sq. mi. in Alaska, the U. S., Mexico, Haiti, Colombia, Ecuador, Peru, Bolivia and Chile.

One crew logged over 100 hr. during an 18-day period in South America.

Latin American Use

Latin American governments are particularly interested in using the aerial surveys for agricultural and timber development. Accurate maps permit the tax assessors to check properly evaluations, also allow agricultural departments to substantiate subsidy arrangements with farmers on various crops. Using infra-red photographs, evaluation can be made of timber, timber harvesting and even counts of board footage can be made.

Continuous high altitude operation necessitates sufficient fuel for six hours duration.

Crew comfort features for such operations include high pressure low pressure oxygen systems.

To accommodate the photographer and his equipment, the P-38's nose has been extended eight feet and widened at the base.

Key factor in aerial surveying is high quality navigational procedure. The photographer sits in the nose of the P-38 in front of and below the pilot and gives him navigation instructions.

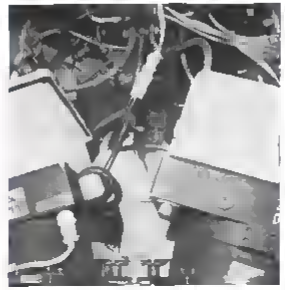
Scale on Nose

To provide preliminary headings, the cameraman sets up flight lines visually, then gives the pilot corrections from a graduated degree scale marked on the P-38's transparent nose. When the plane is on the flight line, a B-3 drift meter is used, with the photographer working with a view finder and associated gyro-compass to correct for crab and establish proper time intervals between exposures.

A trio of cameras is set on a universal joint mount and have leveling

AERIAL PHOTO snapped from P-38 over Montana for U. S. Soil Conservation Service, shows how eroded gullies have been reforested to prevent future damage.

P-38 BEFORE REWORK shows normal nose of World War II fighter days. Modification allows camera installation



ANGLED 12-IN. CAMERAS in modified P-38 complement vertical six-incher. Photographer sits in nose ahead of pilot.

bubbles to indicate tip and tilt. The cameraman operates a control stick to correct the cameras for crab, tip and tilt.

Hycon's Lockheed Lightnings each have a six-inch cartographic camera and two 12-in. K-17s.

This installation provides two scales of the same area: the six-inch camera being mounted vertically, the other two converge at 18 deg. Thus, each six-inch camera picture is covered by four 12-in. photos.

With the cameras being activated at the same altitude and with the scale of the photos being determined from the aircraft's altitude above mean terrain, coverage of the 12-in. cameras is half that of the six-inch equipment.

Camera Coverage

At altitudes of 36,000 ft., where Hycon works for extremely large-area coverage, the scale is 1:72,000 for the six-inch camera and 1:36,000 for the others.

This dual setup provides small scale vertical photography for topographic mapping and large scale convergent material for photo evaluation.

PRIVATE LINES

Rollout of first production Cessna YH-41 helicopter is scheduled by March. The company set up rotary wing production as a full scale department Dec. 3.

First formal board meeting on Cessna 620 four-engine business transport was held by Civil Aeronautics Administration at Wichita, Kan. CAA is checking compliance of the 620 with Part 4b requirements.

Course in flight planning and radio navigation is being offered by Ymgling Aircraft Co., Wichita (Kan.) Municipal Airport to holders of private or commercial licenses. Fee is $1.50 an hour.

Takeoff run over a 50-ft. obstacle of the Temco (TT-1) primary jet trainer has been reduced from 3,250 ft. to 3,000 ft.

A 60-channel crystal-controlled VHF transceiver, the Executive 60, is being produced for the business and private market, retailing at approximately $600. Executive 60 is dynamotor-powered. Unit is made by Wright Airborne.

Electronics, Kansas City, Mo., and is the first of a line of business and private aircraft equipment. Firm also has a new localizer adaptor, WLA-10, which can be added to owner's present VHF receiver, coming up are a light weight, low-cost ADF, an ILS package and a lightweight three-light marker beacon receiver

Type certificate 4A16 has been granted two place Aerocar roadable plane and a limited number are scheduled for production in 1957. Aerocar, Inc. headed by Moulton Taylor, Longview, Wash., is looking for a company with production and sales capacities to handle the project

Price cut has been made by Safe Flight Instrument Corp., N. Y., on its Auto Power equipment. Present list price with Speed Control unit is $4,670, if owner has this portion of equipment, price is $3,975. Previous Auto Power price was $6,200

Export of civil planes weighing 6,000 lb. or less in November totaled 87 units valued at $971,170 bringing the January through November tally to 861 aircraft valued at $11,018,979. This compares with a total for all of 1955 of 595 planes worth $7,288,883

Russians demonstrated a Mil-4 helicopter in Syria. Exhibitions included spray/dusting capabilities.

Total sales of $468,608 are reported by Helio Aircraft Corp. for quarter ending Nov. 30 with net profit being $53,111. Helio states it has a backlog of $602,000 as of Nov. 31

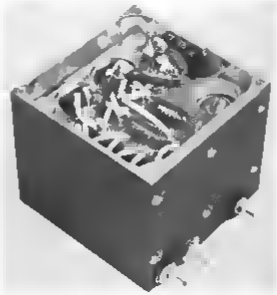
USAF cadets at the Air Force Academy, Denver, Colo., are getting four gliders, three two place trainers and a single-seat sailplane. Gliders will be used to provide basic flight indoctrination.

Bell 47J Ranger executive/utility helicopter which completed a 17,000-mi. demonstration tour of Central and South American was airborne 72 of the 83 days of the tour and required only 40 hr. maintenance of its total 250 flight hours

NEW AVIATION PRODUCTS

Transistor VDC Regulator

Transistorized DC voltage regulator is designed for hard environment and tight space, weight limits. Series power transistor and temperature compensated Zener diode reference voltage are used. Voltage, current, regulation, size and other parameters may be widely varied to suit user's needs. Input voltage is 27.5 VDC ± 15%. Two models are offered, one with output of 20 VDC at



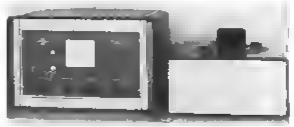
50-250 MA and the other with 20 VDC at 10-150 MA. Regulation is within ± 0.1% for combined variations of input voltage, load, temperature, drift and vibration. Temperature range is from 32F to 150F. Dimensions are 2x2x2 inches.

Western Gear Corp., Electro Products Division, 132 W. Colorado St., Pasadena 1, Calif.

Rotor Trim Actuator

"Flying turnbuckle" actuator lets helicopter pilot trim rotor blade pitch in four seconds on ground or in flight. Chore formerly took ground crew an hour. Fail-safe electric actuator may be controlled automatically. Synchronization requires only 0.1 in. movement of actuator arm. Pilot recognizes synchronization by vibration fade. Actuator weighs 1½ lb. and is powered by miniature DC motor. No stop switches are used to cut out motor. If unit is left on it will stall but not burn out.

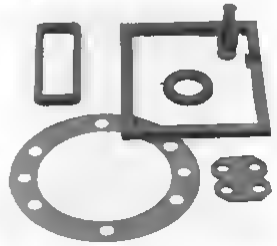
Garrett Corporation, AiResearch Division, 9851 Sepulveda Blvd., Los Angeles 45, Calif.



Gyro Yaw Rate Table

Rate of turn table tests gyros and gyroscopic switches in temperatures between −67F and +187F and at simulated pressure altitudes between sea level and 60,000 ft. Automatic rate programmer permits rate to be sequenced as a function of time in a predetermined cycle and can be supplied as an integral part of equipment. Table is designed to subject a 10 lb. load to rates between zero and 300 deg. per min. and can be used in 20x20x20 in. chamber. Rate fluctuation or wow is less than 1%. Control panel and amplifier may be remote from table. It can be mounted in standard 19 in. rack.

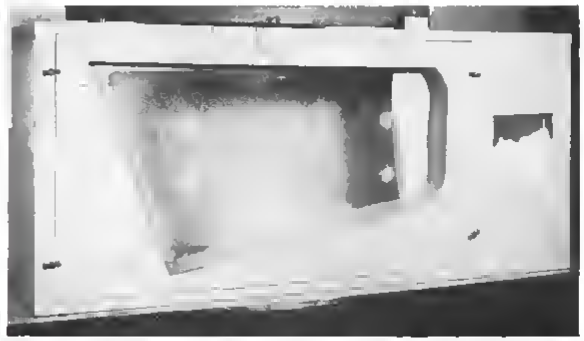
Micro Gee Products, Inc., Box 1005, 6100 W. Slauson Ave., Culver City, Calif.



Molded Silicone Rubber

Very low durometer silicone rubber stock has compressibility in the range of silicone sponge rubber. It can be molded in ⅛ in. to 1 in. sections and ⅛ in. to ½ in. sheets and can be extruded in 10 ft. lengths. It is immune to ozone and weathering and is odorless, non-corrosive and non contaminating. Temperature range is from −100F to +500F.

Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.

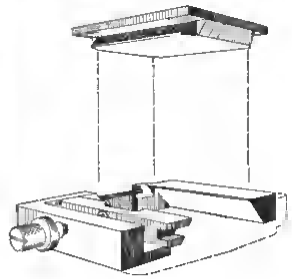


De-Fog Coating

Convair F-106A canopy panel installed as side of cold box, after application of 1 watt per sq. in. for 60 sec., illustrating defogging action of Sierracote. Heavily frosted small panel at right is uncoated plastic. Electrically conductive coating was developed by Sierracin Corp. of Burbank, Calif.

Quick Disconnect Mount

Quick disconnect mount for aircraft cameras and instruments is locked by single screw and is self centering. Lock-



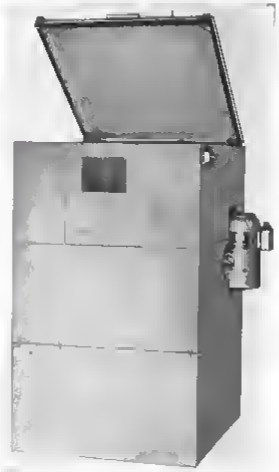
ing forces are evenly distributed around periphery of elements and no motion is possible in any direction. Virtues of mount are made possible by designing receptacle side rails and unclamped edges of dovetail plate to matching 45 deg angles. Self centering and self-leveling features are especially valuable when equipment must be frequently removed and reinstalled.

Huber Industries, Inc., Cincinnati 33, Ohio

Exposure Control

Automatic exposure control for motion picture cameras is intended for industrial and scientific photography where light conditions are uncontrollable. Accent control permits photographer to deliberately change aperture setting from that based on average lighting to one giving best exposure to subject. Response speed gives full travel from f2 to f22 in one second.

Flight Research, Inc., P. O. Box I-F, Richmond 1, Va.



Missile Flight Simulator

Automatic acceleration simulator tests equipment throughout the range of acceleration and deceleration encountered in rocket flights. System duplicates any two-stage flight. Acceleration deceleration unit uses vector seeking specimen mount which eliminates virtually all undesirable side accelerations. Acoustic specimen cavity and special microphone collect data by audio sensing so that hermetically sealed specimens can be tested.

Magnavox Co., Dept. NP., Fort Wayne 4, Ind.

What's special about these pneumatic controls?

Janitrol aircraft pneumatic controls are special because each new control has a backlog of successful, service-proved designs behind it. *Many designs incorporate multiple functions in an integrated package*—actuation, pressure regulation, and air control. Inevitably the "package" weighs less, takes up less room than separate controls. Choose from service proved designs or set your own requirements.

Three of many different types in service: 1. Canopy seal regulator actuates mechanically by canopy movement—maintains pressure in inflated seal, but releases instantly for emergency escape. Auxiliary port provided for other uses. 2. Pylon tank regulator with relief valve, maintains constant pressure for fuel transfer. 3. High pressure anti-icing valve, regulates jet engine bleed air pressure for use in anti-icing systems.

Janitrol's pneumatic controls are an outgrowth of long engineering and manufacturing experience in aviation air handling and heat transfer equipment.

Janitrol Aircraft-Automotive Division, Surface Combustion Corporation, Columbus 16, Ohio . . . District Engineering Offices: Washington, D. C., Philadelphia, Columbus, Ft. Worth, Hollywood.

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It provides

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- **D. C. POWER . . . 28.5 volts, up to 2250 AMP. For Split or single bus start and servicing.**
- **COMPRESSOR . . . Air supply up to 3500 psi, 13.5 CFM, 1,000 cu. in. reservoir**
- **TOWING . . . All-wheel drive vehicle with mechanical or torque converter transmission, as desired**

IN ACTIVE USE WITH U. S. AIR FORCE, NAVY AND MARINE UNITS. Other models of single and multi purpose ground support equipment are available with any combinations of AC and DC power, high pressure air, hydraulics, and low pressure air, refrigeration and heating.

CONSOLIDATED'S resourcefulness in solving the most challenging problems in the design and manufacture of ground support equipment attests to its ability to develop specialized units to fit your individual needs.

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Britain Reopens Air Base as Safeguard

London—To safeguard its military air link with the Far East, Britain has decided to reopen an airfield at Addu Atoll in the Maldive Islands.

The islands lie about 500 miles southwest of Ceylon, below the southern tip of India. The base will release Britain from its dependence on the present routes which rely on the goodwill of India and Ceylon.

Attitude of both Commonwealth countries during recent months has given rise to fears in British military circles that they would withdraw landing or fly over rights in any Far East crisis in which they were not directly involved.

Such action could sever Britain's air connections with the Far East and Australia.

Forthcoming entry into RAF service of longer-range aircraft such as the Bristol Britannia makes possible the route directly across the Indian Ocean. Reactivation of the Addu base also would enable the British to bypass the Middle East entirely, if necessary, by flying through Africa.

The airfield, on Gan Island in the Addu Atoll, will not be developed as a base but as a staging and refueling stop. Built during the war, the airstrip now is overgrown with vegetation. An Air Ministry survey of the island in 1952 indicated that construction of a modern airfield there was practical.

Communication facilities will be set up on the adjacent island of Hittadu.

The Maldive Islands, an independent sultanate with about 93,000 inhabitants on some 2,000 islands, have been under British protection since 1887.

Los Angeles Airport Revenues Increase

Los Angeles—International Airport revenues increased 29% during Fiscal 1955-56 and passenger traffic was up 18%. Revenues totaled $2,517,363 during 1955-56 and 3,627,886 passengers were handled.

Air mail was up 5.4%, air freight increased 12%, and air carrier movements were up 9%.

Stock Transactions

Washington—Four officers of Pan American World Airways have acquired common stock through exercise of options.

R. G. Ferguson, treasurer, acquired 875 common shares for a total holding of 3,259 shares. Willis G. Lipscomb, vice president for traffic and sales, acquired 1,500 common shares through exercise of option to make a total holding of 7,906. Samuel F. Pryor, vice president and assistant to the president, acquired 1,875 shares for a holding of 11,952. Juan T. Trippe, Pan American president, acquired 9,375 common shares through option for a total direct holding of 57,164 shares and an indirect holding in trusts of 40,000. Other stock transactions:

Aero Supply Mfg. Co. Inc. Acquisition of 1,800 common shares by Henry M. Margolis director for a direct holding of 25,911 and an indirect holding of 25,601. Disposal of 120 common shares by Leo Strauss officer, leaving a holding of 17,773.

Aeronca Mfg. Corp. Acquisition of 38,000 common shares through exercise of option by John A. Lawler officer and director for a holding of 52,000.

American Electronics. Acquisition of 500 and disposal of 500 common shares by Warren H. Crowell officer and director for a direct holding of 4,196.

Avco Mfg. Corp. Acquisition of 1,000 common shares by Irving B. Babcock director for a holding of 1,097; acquisition of 300 shares of $2.25 preferred by C. Coburn Darling director for a direct holding of 800 and an indirect holding of 600.

Boeing Airplane Co. Disposal of 100 common shares by Ivan M. Nelsen officer leaving a holding of 1,604.

Braniff Airways Inc. Disposal of 4,000 common shares by C. G. Adams officer and director, leaving a holding of 6,765.

Capitol Airlines Inc. Disposal of 100 common shares by Hayes Dever officer leaving a holding of 9,100; disposal of 4,000 common shares by Charles H. Murchison director leaving a holding of 10,532; acquisition of $60,000 of 4½% debentures by J. D.

Stetson Coleman, director has a holding of $60,000.

Continental Air Lines Acquisition of 600 common shares by Walter F. Parpcke, director, for a holding of 1,500; acquisition of 100 common shares by Russ Stewart, director, for a holding of 100.

Curtiss Wright Corp. Acquisition of 100 common shares through exercise of option by Joseph V. Mirelo, officer, for a holding of 1,000.

Eastern Air Lines Inc. Acquisition of 1,700 common shares by Laurance S. Rockefeller, director, for a direct holding of 80,000 and an indirect holding of 1,700.

Emery Air Freight Corp. Acquisition of 250 common shares by Peter J. Byrne, officer, for a holding of 2,150; disposal of 300 common shares by A. M. MacIver-Campbell, officer, leaving a holding of 2,300.

Fairchild Engine & Airplane Corp. Acquisition of 100 common shares by Paul S. Cleveland, officer, making a holding of 113.

Flying Tiger Line Inc. Disposal of 400 common shares by James E. Davidson, director, his total holding.

General Dynamics Corp. Acquisition of 1,000 common shares by Robert C. Tait, officer and director, for a holding of 2,450.

General Electric Co. Acquisition of 1,350 common shares by George E. Burens, officer, making a holding of 4,950.

General Motors Corp. Disposal of 2,257 common shares by Sherred E. Skinner, officer and director, leaving a direct holding of 5,501 and an indirect holding of 8,178.

Lockheed Aircraft Corp. Disposal of 200 capital shares by Robert E. Gross, director, leaving a holding of 10,800.

Minneapolis-Honeywell Regulator Co. Acquisition of 100 common shares by W. W. Gilmore, officer, for a holding of 1,400.

National Airlines Inc. Acquisition of 100 common shares by G. T. Baker, officer and director, for a holding of 167,164; acquisition of 100 common shares through exercise of option by L. W. Dymond, officer, for a holding of 300.

North American Aviation Inc. Acquisition of 500 capital shares by Henry B. Du Pont, director, for a holding of 4,000.

Northwest Airlines Inc. Acquisition of 200 common shares by Whitelock Whitney, director, for a direct holding of 800 and an indirect holding of 1,000.

Pacific Northern Airlines Disposal of 500 common shares by Joseph H. Foster, officer, leaving a holding of 1,700.

Radio Corp. of America Acquisition of 100 common shares by Elmer W. Engstrom, officer and director, for a holding of 1,082.

Rohr Aircraft Corp. Disposal of 1,000 common shares by Fred H. Rohr, director, leaving a holding of 40,000.

Ryan Aeronautical Co. Acquisition of 100 common shares by Emtor Inc., beneficial owner, for a holding of 40,200.

Solar Aircraft Co. Disposal of 440 common shares by L. Franklin Rorth, director, his total holding.

Temco Aircraft Corp. Acquisition of 225 common shares by J. Nevin Talley, officer, for a holding of 225.

Texas International Inc. Disposal of 400 common shares by Bryan F. Smith, officer, leaving a holding of 14,016.

United Air Lines Inc. Disposal of 200 common shares by R. E. Ahrens, officer, leaving a holding of 2,762; disposal of 151 common shares by Curtis Barkes, officer and director, leaving a holding of 2,300; disposal of 400 common shares by Donald F. Megarrell, officer, leaving a holding of 2,500; acquisition of 2,000 common shares through exercise of option and disposal of 600 common shares, for a holding of 2,501; disposal of 100 common shares by D. R. Petty, officer, leaving a holding of 2,016.

United Aircraft Products Acquisition of 100 common shares by Joseph T. Morris, officer, for a holding of 825.

Western Air Lines Inc. Disposal of 900 capital shares by Marvin W. Landes, officer and director, leaving a holding of 1,500; acquisition of $15,000 of 4½% convertible debentures by William S. Hartman, director, for a direct holding of $65,000 and an indirect holding of $33,000.

Westinghouse Electric Disposal of 2,000 common shares by John M. Schiff, director, leaving a holding of 10,500.

Army's New Square Dancer

Complete to corncob pipe, this gaily bedecked H-19D is one of four elaborately costumed Sikorsky helicopters, replacing smaller Bell H-13s, that have entertained the public at numerous air shows with their superb aerial square dancing routines at minimum altitudes. An appropriately "attired" Bell H-13 has been retained as the "caller" in the act.

Navy Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Navy Contracting Offices:

AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.:

The William Brand & Co., Inc., North and Valley Sts., Williamantic, Conn., wire with braid (3/8/2140-1348 D 6/1/53), 55-62800 lb., $54,936.

Lile Mfg. Co., 225 W. 34th St., New York 1, N. Y., targets, (IFB-383-430-57), various, $200,114.

Link Aviation, Inc., Hillcrest, Binghamton, N. Y., shims, washers, screw assys., bellows assys., (383/6501-10/57/NR), various, $27,527.

Ampraf Paint Co., Inc., 10930 Elliott Ave., El Monte, Calif., enamel, (JD-IFB-383/2,985 56), various, $26,012.

Collins Radio Co., Cedar Rapids, Iowa, cabinets, switches, gaskets, (383/2136 30 E 1/2/53, 380/2120 126/53), various, $46,280.

Utica Div., Bendix Aviation Corp., Utica, N. Y., parts for various A/C, (383/2136-855/53), various, $65,721.

The New York Air Brake Co., Watertown, N. Y., pistons, pivots, (383/2136-826/53), various, $34,195.

General Electric Mfg. Co., 228 W. 44th St., New York, N. Y., motors, (383/2146-1670 E 4/1/53), 1662 ea., $52,730.

Grimes Mfg. Co., 515 N. Russell St., Urbana, Ohio, anti collision beacons, (JD Pren 11-383-57), various, $147,683.

Metimpex Corp., 730 Fifth Ave., New York 19, N. Y., pigment, (IFB-383-03-57), 541,350 lbs., $70,484.

Rob Paint & Varnish Co., Inc., 47-08 5th St., Long Island City 1, N. Y., paint, (JD-IFB-383/685-57), various, $58,180.

Columbus Div., North American Aviation Inc., 4300 E. Fifth Ave., Columbus 16, Ohio, glass tank assys., (383/2136-2126/51, 2116-1160/52), various, $1,832,622.

Hydro-Aire, Inc., 3000 Winona Ave., Burbank, Calif., valves, (383/2150-373/54), various, $80,710.

Koring Railroadiles & Machinery Inc., 2000 Albert St., Racine, Wis., metal cutting saws, (IFB 383/2018-55), 26 ea., $42,179.

Essex Wire Corp., 1601 Wall St., Fort Wayne, Ind., cable, (IFB-383-231 57), various, $45,589.

The Sherwin-Williams Co., 325 N. Broad St., Philadelphia 7, Pa., lacquer, (IFB 383-268-57), various, $27,650.

Emmar Inc., P. O. Box 2153, Wichita 1, Kans., lacquer, (IFB 383-206-57), 20000 gal., $42,800.

Consolidated Diesel Electric Corp., Ludlow & Canal Sts., Stamford, Conn., mobile power parts, (383/5800 J78/57), 4 ea., $70,450.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia 4, Pa., voltmeters, (IFB-383 317 57), 331 ea., $37,311.

Airmeor Products Inc., 13002 Ventura Blvd., N. Hollywood, Calif., brake releases, (383/2110-1486-53), 3010 ea., $83,017.

Thompson Products Inc., 26555 Euclid Ave., Cleveland 17, Ohio, bearings, gears, (383/2114-14/54), various, $261,053.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Dr., S. Bend 20, Ind., parts for Bendix Control assys., (383-2118-23 of), various, $219,445.

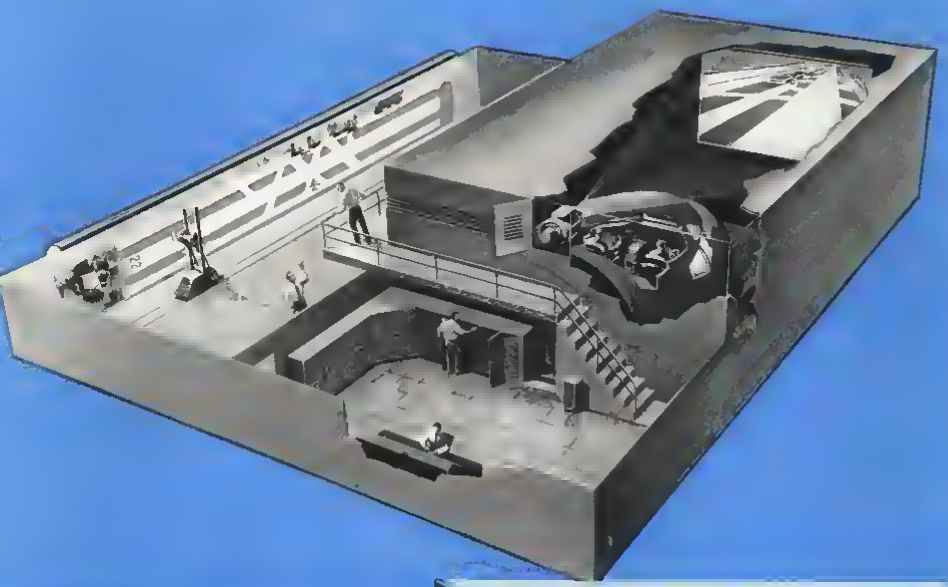
Holley Carburetor Co., 11955 E. Nine Mile Rd., Van Dyke, Mich., services & repair parts for fuel controls, (MIPR 41-608-T-02A 2380), various, $141,476.

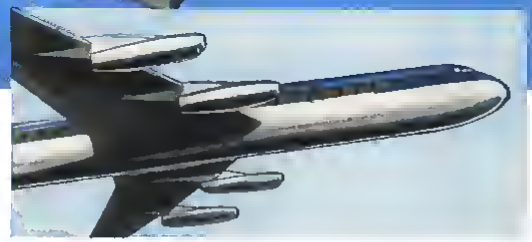
Boole Bros. Gear & Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill., screw jacks, (383 2110 850/53), 68 ea., $36,356.

Production Research Corp., Claremont Ave., Thornwood, N. Y., control units, (383/2140-5036/55, 383/2140-175/55), various, $46,826.

Holley Carburetor Co., 11965 E. Nine Mile Rd., Van Dyke, Mich., services & repair parts for fuel controls, (MIPR 41-608-T-03 D 2380), various, $85,097.

Aluminum Co. of America, 1200 Ring





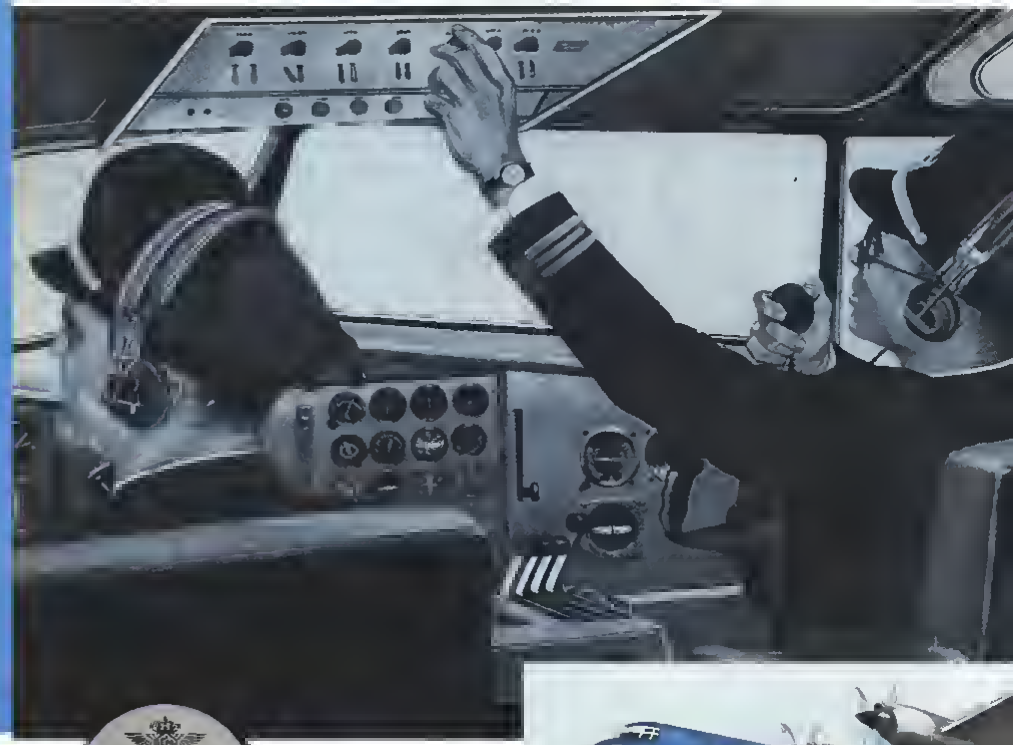
KLM ROYAL DUTCH AIRLINES **selects**

LINK DC-8 *flight simulator*

To help train pilots and crews in transoceanic jet flight, Link will build KLM-Royal Dutch Airline's DC-8 jet flight simulator.

Long before the first of these mighty four-jet Douglas transports is delivered, KLM's personnel will have already learned the "feel" of the plane. They will have trained in conditions precisely simulating actual flight, practicing crew coordination, radio procedures, navigation, landings, takeoffs and the handling of emergency conditions.

Keeping pace with progress in every field of aviation is the watchword at Link . . . where advanced electronic engineering is helping to make tomorrow's flight better and safer than ever before.



KLM ROYAL DUTCH AIRLINES **pilots**

will train in LINK *Electra simulator*

The world's first Electra simulator has been designed and developed by Link. Pilots and crews for KLM-Royal Dutch Airlines' new Lockheed Electra fleet will train in this advanced propjet simulator . . . just as the personnel slated to operate KLM's new DC-8's will get the feel of jet flight in a Link DC-8 simulator.

By reproducing the cockpit and precise flight performance of the Electra in exact detail, Link engineering will make it possible for KLM personnel to experience actual "flight" in the new propjet. Long before KLM receives delivery, pilots and crews will have practiced and learned all flight procedures: landings and takeoffs, crew coordination, radio techniques and especially emergency procedures.

Once again, Link scores a major contribution in aviation progress . . . helping to build better, safer flight through advanced electronics engineering.

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Two-Place Cougar

Two place Grumman F9F-8T trainer is in production for Navy. Airplane is stretch version of basic Cougar design which has been in production as a fighter and photo aircraft. Plane can exceed Mach 1 in shallow dive; nose section was lengthened 34 in. to accommodate second cockpit.

Bldg., Washington 6, D. C., aluminum alloy shapes (1FB-383-145-57) various, $20,984.

Sperry Gyroscope Co., Div. of Sperry Rand Corp., Great Neck, N. Y., bearings (383/29081-545 G 2/1/57, 383/29081-774 G 2/3/57, 383/29081-1025 G 2/3/57), various, $38,138.

Pac-Air Paint Products Co., Inc., 420 Bacon St., Bronx 58, N. Y., enamel (JD-1FB-383/2296-56) various, $25,368.

Accessaulical Machinery Corp., C/O Nestor Johnson Mfg. Co., 1800 N. Springfield Ave., Chicago 47, Ill., jacks (383/29005-42 S 2/5/57), 90 ea., $73,125.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., parts for ROD spares, (383/2110-1285 A 4/1/56), various, $29,388.

Ingersoll-Rand Co., 2037 Chestnut St., Philadelphia 3, Pa., compressors (383/29361-172 S 3/5/57), 123 ea., $325,040.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., pistons, (383/2110-6-58/55), 37 ea., $29,211.

The Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, Ohio, steut assy., (383-2110-8042/55) various, $55,539.

Machine Compass Co., Malinkeeseli St., Pembroke, Mass., compass magnetics, (1FB-383-418-57) 21320 ea., $83,163.

Micro Switch, A Div. of Minneapolis Honeywell Regulator Co., Freeport, Ill., switches, (383/2140-372/55, 383/2140-3117 E 4/1/53), various, $20,286.

F5D Landing Attitude

Douglas F5D-1 Skylancer, with leading edge slats extended for landing, will be an off-the-shelf item for procurement if necessary (AW Dec. 10, p. 28). Because of budget considerations, Navy has cut back number of test models from 19 to 11 and will not order a production version. F5D, equipped with more powerful version of Pratt & Whitney J57 engine than F4D predecessor, has exceeded 1,015 mph. Thompson Trophy race speed of Chance Vought F8U Crusader. View shows how engine intakes are extended further forward and have thinner lip than F4D. F5D has longer, thinner nose, larger tail, and larger engine nozzle. Underwing extensions are landing gear doors.

Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, N. Hollywood, Calif., maintenance parts, (383/2110-1319 X 1/1/53) various, $74,133.

General Electric Co., 3 Penn Center Plaza, Philadelphia 2, Pa., amplifiers (383/2120-153/54), 7 ea., $61,731.

Molabar Mfg. Co., 950 Doolittle Dr., San Leandro, Calif., airplane jack spare parts, (383/29085-57 S 3/1/57) various, $50,618.

Holley Carburetor Co., 11955 E. Nine Mile Rd., Van Dyke, Mich., maintenance parts, (383/2118-139/53) various, $383,987.

All American Engineering Co., Box U.S.S. 2063, DuPont, Alexandria, Wilmington 9, Del., winch assys. & repair parts (383/28055-2 X 5/57, 383/2150-383/54) various, $73,403.

B. F. Goodrich Tire Co., A Div. of the B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, maintenance parts & assys. for various A/C (383/2110-1347 X 1/11/53) various, $32,348.

E. K. Sweeney Mfg. Co., 1601 32nd St., Denver, Colo., tools (383/2120-5003 S 2/1/56), various, $113,947.

Kollsman Instrument Div., Bendix Aviation Corp., Tateeboro, N. J., instruments for various A/C (383/2120-250/53) various, $73,384.

North American Aviation Inc., Columbus Div., 4300 E. Fifth Ave., Columbus 16, Ohio, special support equipment for A3J and FJ2 A/C (383/29005-29 S 3/1/57) various, $25,821.

General Radio Co., 275 Massachusetts Ave., Cambridge, 39, Mass., replacement parts for radios, (1FB-383-473-57) various, $24,525.

The Deutsch Co., 7000 Avalon Blvd., Los Angeles, Calif., AN fittings (1FB-338-444-57), various, $24,148.

AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.:

Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky., aluminum alloy, various, (1FB-383-189-57), $574,121.

Sperry Gyroscope Co., Sperry Rand Corp., Great Neck, N. Y., force links, various, (383/2118-1182 X 1/1/52), $39,857.

Vestal Aircraft Corp., 130 Woodland Ave., Morton, Pa., ground handling equipment, various, (383/29005-15 S 3/1/57), $52,598.

B. F. Goodrich Tire & Equipment Co., B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, deicer boots various (383/2118-1217/53), $510,631.

Webco Aircraft Corp., 3820 Ontario St., Burbank, Calif., seats for various A/C various, (1FB-787-165-57) $325,428.

Henry Spen & Co., Inc., 1589 Pitkin Ave.,

Brooklyn 7, N. Y., oxygen servicing trailers, (1PB 383/2228-58) $72,458.

General Electric Co., 3 Penn Center Plaza, Philadelphia, Pa., parts for various instruments, various (383/2130-282-53), $54,573.

United States Rubber Co., 1 Morkel St., Passaic, N. J., rubber aircraft hoses, various, (1PB 383-775-57), $262,709.

General Electric Co., 3 Penn Center Plaza, Philadelphia 7, Pa., instrument maintenance parts, various (383/2120-437 N S/2/53), $64,734.

Telephonics Corp., Park Ave., Huntington, L. I., N. Y., headset assys, 24500 ea., (383/2140-1813 E 2/1/53), $64,734.

Bendix Radio, Bendix Aviation Corp., E. Joppa Rd., Towson 4, Md., capacitors, variable assys., various, (383/2140-247/a4), $34,872.

Weber Aircraft Corp., 2830 Ontario St., Burbank, Calif., A/C servicing platforms, various (383/2110-811/55 383/2118-8114/55 383/22055-54 S-3/8/57), $111,832.

Engo Machine Co., Inc., 81 S. Lexington Ave., White Plains, N. Y., armament parts, 353 ea., (JD 1PB 383-443-a7), $25,410.

O. E. Szekely & Associates, P. O. Box 269, Commerce, Ga., parts for ground equipment various, (383/2506b S S 2/1/a7), $Pa,-510.

Adel Precision Products, General Metals Corp., 10777 Van Owen St., Burbank, Calif., hyd. valves, 183 ea. (383/2150-975 N 4/1/57), $28,785.

Chikaso Co., 328 N. Pamona Ave., Brea, Calif., joint assys, various (383/29081 1330 G 1/1/57), $34,984.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Calif., stack assys, various, (383/2118-2137 A 4/5/51), $187,150.

Columbus Div., North American Aviation, 4300 E. Fifth Ave., Columbus 16, Ohio, airplane wings, 62 ea. (383/22357 J6 S 3/5/57), $26,517.

Mellaplex Corp., 730 Fifth Ave., New York 19, N. Y., pigmeal cupraus oxide vorleus, (1PB 383-815-57), $142,097.

Swift and Low

Vickers Supermarine Swift F. R. 5 of RAF No. 79 squadron flies past a mountain top memorial near Detmold, West Germany. Swift F. R. 5, which British claim is the fastest low-level fighter reconnaissance jet plane in any air force, is now flying with RAF squadrons in 2nd Allied Tactical Air Force in Germany. Swift carries cameras in nose and is armed with two 30 mm. Aden guns. Airplane is powered by Rolls-Royce Avon engine with after burner, has provision for four rockets under each outer wing panel and jettisonable wing tanks under fuselage.

Russian Aeroflot Planes Guard Siberian Forests

Russian Aeroflot An 2 Workhorse (above), pre-World War II aircraft which Soviet civilian air agency uses for everything from crop-dusting to air lift in remote areas. Plane above is on fire control duty in the Siberian Krasnoyarsk territory. Mi-4 Hound helicopter (left) of Aeroflot also is on fire control duty in Siberian forest area, which stretches from Arctic Circle to border of Mongolia

WHO'S WHERE

(Continued from page 23)

Changes

David F. McCallister, chief engineering flight test section All American Engineering Co., Wilmington, Del.

Maurice Ellis, district sales manager (New England) Varig Airlines of Brazil.

Fred B. Ortman, associate director, Stanford Research Institute, South Pasadena, Calif.

John H. Mahoney, director traffic, American Airlines, Inc.

Larry Decker, assistant to the vice president-traffic and sales, Bonanza Air Lines.

Paul L. Layton, national aircraft engineering representative, (Los Angeles, Calif.) Textile Products Division, Owens-Corning Fiberglas Corp., Toledo, Ohio.

John Rane, director engineering and sales, Aircraft Division, Bell Aircraft Corp., Buffalo, N. Y. Also, **George Ray**, chief engineer; **Stan Smith**, chief project engineer, **John Weisbeck**, contracts manager.

Floyd Walter, director manufacturing, Rockets Division of newly formed Weapon Systems Division, Bell Aircraft, Buffalo, N. Y. Also, **Dewey Ruchart**, director engineering, **Steve Krull**, director tests, **Joe Piselli**, manager customer relations and sales, **Mel Blessing**, manager contract administration.

Ralph Matthews, Jr., Eastern sales representative, AiResearch Aviation Service Division, Garrett Corp., Los Angeles, Calif.

Steven E. Puffer, director procurement, Minneapolis-Honeywell's Aeronautical Division, inertial guidance engineering plant (under construction), St. Petersburg, Fla.

Victor A. Camfield, Dayton representative, Ryan Aeronautical Co., San Diego, Calif.

Thomas Dunsheath, technical director-automatic control system section, Cook Research Laboratories, division Cook Electric Co., Chicago, Ill.

Paul Stearns Ellison, public relations director, Cook Electric Co., Chicago, Ill.

J. P. Lawler, Washington representative, Aeronca Manufacturing Corp., Middletown, Ohio.

Marvin J. Kahn, assistant director-engineering, Aircraft Armaments, Inc., Cockeysville, Md. **Richard A. Husch** succeeds Mr. Kahn as chief aerodynamics and structures engineer.

Alec Symon, manager-sales engineering, Bristol Aircraft Limited, Bristol, England.

Ralph Lehman, manager, Aircraft Equipment Sales, Federal Telephone and Radio Co., Clifton, N. J.

James H. N. Greenshields, chief check pilot, Kenting Aviation Ltd., Oshawa, Ontario, Canada.

Frederick Harris, consultant and technical representative (Dayton, Ohio), Kaman Aircraft Corp., Bloomfield, Conn.

Donald C. Wagner, plant manager, Magnetic Research Corp., El Segundo, Calif.

Brig. Gen. Marshall A. Tyler (USMC ret.), engineering manager, Prewitt Aircraft Co., Clifton Heights, Pa.

Harvey T. Herrod, regional manager (Washington, D. C.) Air Associates, Inc., Teterboro, N. J.

Picture of a young man

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Success doesn't just happen to a company or to an individual. Success comes as a result of clear thinking and long-range planning.

And that is just what the young engineer in the picture is doing. He is studying the many possibilities of a career in guided missiles.

The book he is reading is entitled "Your Future in Guided Missiles with Bendix". It is one of the most complete guides to job opportunities in the guided missile field. It also contains a detailed background of the functions of the various engineering groups such as systems analysis, guidance, telemetering, steering intelligence, component evaluation, missile testing, environmental testing, test equipment design, reliability, propulsion and other important engineering operations.

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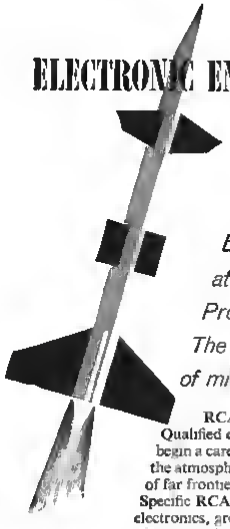

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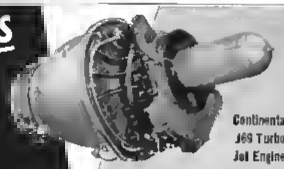

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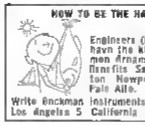

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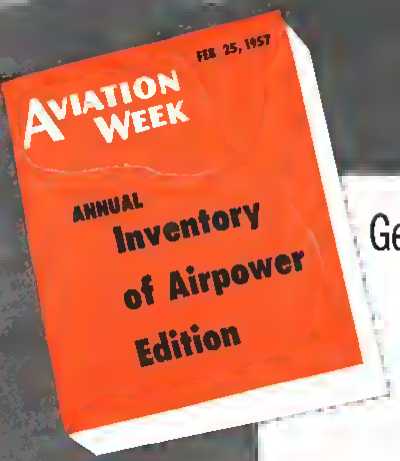

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Mohawk Airlines, Inc.
Ithaca, N. Y.

We were very much impressed with your editorial "Don't Scare the Passengers" in your issue of Dec. 10.

May we have permission to publish this to our personnel?

J. B. FRANKLIN, VICE PRESIDENT
Operations and Maintenance
Capital Airlines Inc.
Washington, D. C.

Airline Employes

Your editorial in the Dec. 10 issue of AVIATION WEEK entitled "Don't Scare the Passengers" has some good ideas. While I am not a passenger who scares easily, I agree that the airlines could just as well pass out more information on the causes of delays.

I think, however, that your sarcasm regarding the tone of voice of reservation clerks is not justified. I do not pretend to be an authority on the subject, but I get around a bit and in my opinion airline employes generally are the most uniformly polite and considerate group of people whom I have encountered.

HOWARD C. PAGE
General Electric Co.
Schenectady, N. Y.

(Reader Page has a point. Airline reservation personnel generally are polite and considerate. Our reference was to several specific airlines where, until competition appeared on their routes recently, the customer was treated as though the airline was doing him a favor by selling a seat. Even on these lines, however, competition has brought an improvement in the handling of passengers.—Ed.)

Blunder

Your editorial, "Don't Scare the Passengers," in the Dec. 10 issue, of AVIATION WEEK is tops. If only all the airlines realized how important the little things are to air passengers. As an enthusiastic member of the community that flies every chance it can, and has some 150,000 miles of flying under her belt, I can tell you very frankly that the increasing snails of takeoff and switching connections and lost connections because of fumbling delays and what not are cooling my enthusiasm for flying very greatly.

As an active participant in every phase of safety whether it is ground traffic highway safety or air safety, the keynote of which always is to keep everybody calm otherwise decisions are faulty and actions are hasty, I was shocked by one experience which you might make use of sometime.

Namely: On a flight from Dayton, Ohio to Chicago a passenger right behind me on the right side of the plane was making his first trip, and the hostess was trying to brief him on everything possible connected with flying. About halfway to Chicago I noted, as everybody else did, a thunderhead to the north which most of us who fly that route frequently realized we would have no contact with whatsoever.

Imagine my amazement when I heard the hostess point this thunderhead out to this new passenger, and describe it as a particular vicious thunderhead and express the hope that we would not need to tangle with it. It did not take a doctor to see the apprehension in this passenger's face. If I had obeyed my first reactions I would have reported this hostess. But I thought perhaps she would learn as she got older, and someone would hear her in a better position to educate her.

While the prattle and chatter from the cockpit becomes annoying when you fall asleep—it is a very real asset when one is following an unusual and delayed pattern, such as, being stacked over an airport. Here, again, I remember a trip from Philadelphia where this friendly casual conversation as to why we were going up almost as far as Milwaukee and returning to almost as far as Michigan City in an attempt to get on the ground in Chicago made a very interesting and fast moving last hour. If the tone quality of the PA system is down low enough so it will not startle a person when he is asleep, it is a real adjunct. But all too often it is pitched too high and jerks one out of a sound sleep which is most annoying in fact not very healthy.

HERMAN S. KUHN, M. D.
Hammond, Indiana

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42nd St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Midget Racers

In your editorial of Dec. 17 entitled, "Dim Future for National Air Show," there is a statement with which I would like to take issue. The statement I have reference to is: "Post war efforts to revive close course racing never really succeeded, despite a brief experience with midget racers."

This "brief experience," which began in 1947 is still in progress as will be attested to by the more than 100,000 people who attended NAA sanctioned midget races during 1956 at Niagara Falls, N. Y., Springfield, Ill., and Oshkosh, Wis.

A glimpse at the first ten years of midget racing should do much to refute the idea that post war racing has been less than successful.

Twenty five races have been held under National Aeronautical Association supervision.

Sixty specially built aircraft have passed thorough tests for sound design and construction and have been flown in sanctioned competition.

Eighty pilots have met stiff ability and experience requirements and have raced in sanctioned competition.

No fatal accidents have been recorded in sanctioned competition since 1950, and only one ever in a major race.

Compare these figures with corresponding data for pre war racing which you deem, by inference, to have been successful. The inescapable conclusion is that post war closed course racing, as exemplified by the midget plane class, has reached a level of success previously unknown in air speed competition.

While the Industry/service-sponsored National Aircraft Show is sagging the more personal and individual civilian air shows, featuring closed course racing, are on the rise. Three races in 1956, plans for at least twice that number in 1957 and the indication that the traditional National Air Races may soon be revived.

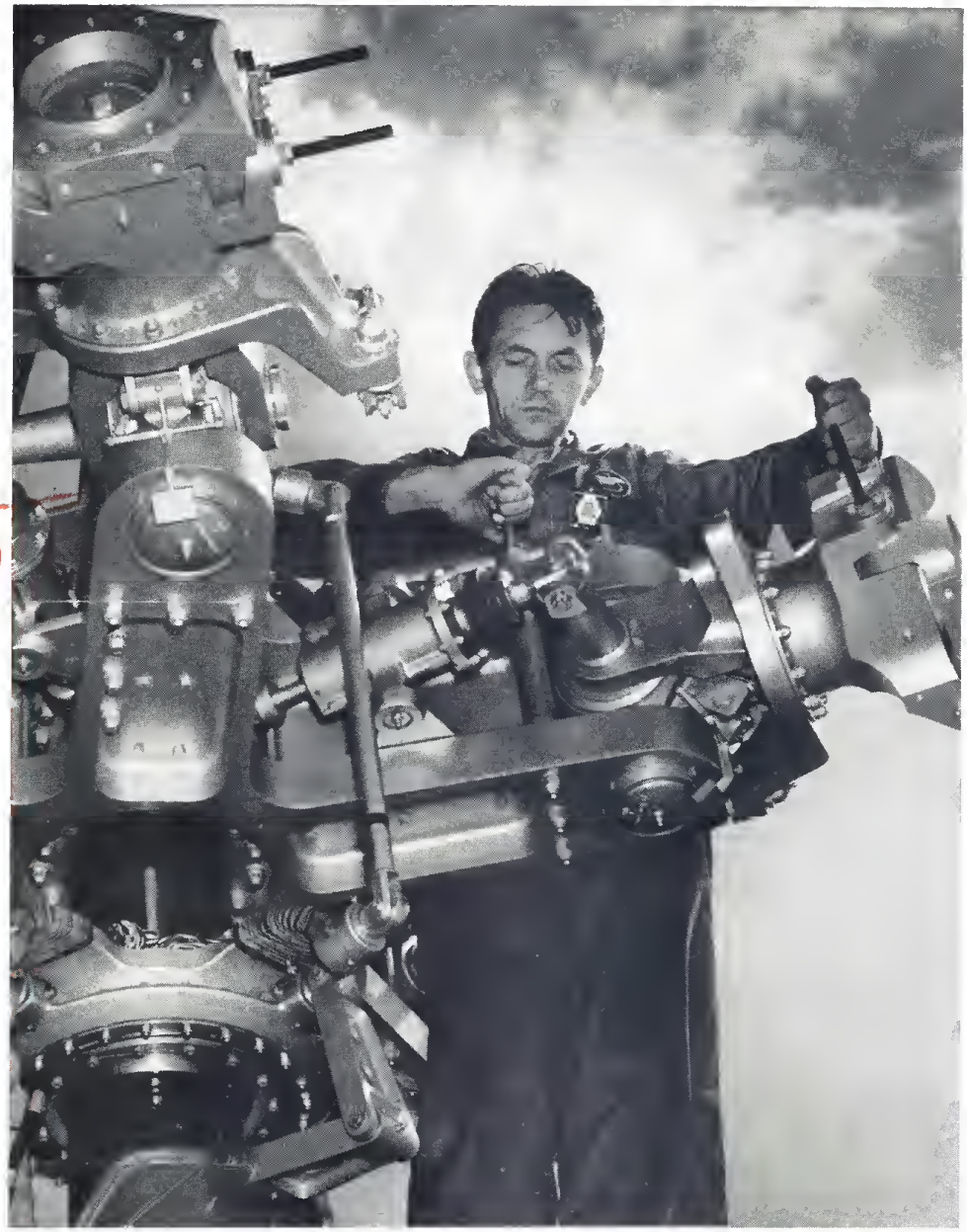
Is it not more than a mere possibility that herein may lie part of the solution to the problem of the younger generation's declining interest in aviation which is showing up so markedly in the shortage of pilots and engineers? DOV BERLINER
Chairman, Publicity Committee
Professional Race Pilots Assn.
Columbus 9, Ohio

(The editorial comment quoted above referred only to the closed course racing at the National Air Show. This stopped after the 1949 races in which William Odom was killed by a crash into a Cleveland suburb. AVIATION WEEK is well aware that midget racing has sought other outlets and has published many pictures of new midget racing planes.—Ed.)

Oops!

In regard to your article "Polar Route Shows Market Potential" I find that my travels in Europe would be extremely limited, especially if I flew according to the map on p. 38 of the Dec. 24 issue. Who moved Copenhagen? R. A. MIRLEY
110 East Park St.
Westerville, Ohio

(Reader Morley will find he can travel anywhere in Europe via Polar routes. AVIATION WEEK's map showed only European terminals of polar routes omitting vast network of airline services connecting at these terminals. Red faces for AVIATION WEEK's art editors who in a holiday mood, shifted Copenhagen from Denmark to Sweden.—Ed.)



Sikorsky rotor heads stress ESNA

A 16-year fastener field test

How many different stresses are exerted on this rotor head as it controls the cyclic and collective pitch of the five main blades of the Sikorsky S56 designed to transport 26 fully equipped troops? Since it also transforms engine power into forward motion or vertical flight, the stresses add up to an interesting but complicated problem in dynamics. Notice that Sikorsky has solved the fastening problems related to this rotor head design with dozens of standard hexagon and double hexagon Elastic Stop nuts.

They are self-locking, maintain precision adjustments and assure fastener security under the vibration and stress loads normal to helicopter flight.

Sikorsky Aircraft Company had been using Elastic Stop nuts for over a decade before it began developing rotary wing aircraft in 1939. They have been a steady ESNA customer for 27 years and Elastic Stop nuts have been a standard fastener on every new Sikorsky design.

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